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EDITED BY GEORGE MORRIS PIERSOL, M.D.

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FROM THE PREFACE

The present time has seemed to me fitting for the production of a text-book which while not neglecting the data of physiology, should lay special stress on the significance of these data, and attempt to weave them into a fabric representing the principles which are guiding physiologists and physicians of the present day in their endeavors to extend the bounds of the known and to increase their powers of control over the functions of living organisms.

In a science such as physiology, based on so wide a discipline and with so diverse a technique, it is almost impossible for any one man to attain to a personal acquaintance with all its branches. In the present book I have therefore not hesitated to avail myself of the work of masters of science in fields which I had not myself explored. Thus, in the physiology of the nervous system, which has been transformed and built up on a new basis by the work of Sherrington, I have endeavored to follow this author as closely as possible.

Throughout the work I have sought to show that the only foundation for rational therapeutics is the proper understanding of the working of the healthy body. Until we know more about the physiology of nutrition quacks will thrive and food faddists abound. Ignorance of physiology tends to make a medical man as credulous as his patients and almost as easily beguiled. I trust, therefore, that the following pages will be found of value not only to the candidate for a university degree, but also to the practitioner of medicine in equipping him for the struggle against the factors of disease.

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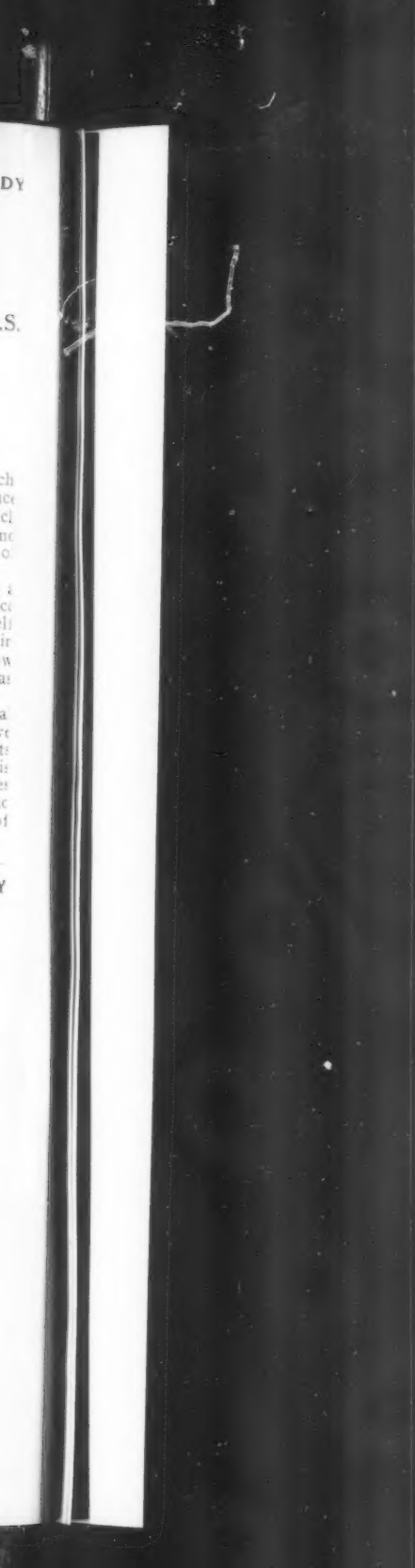

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THE

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SEPTEMBER, 1912

ORIGINAL ARTICLES

A STUDY OF THE ENDOCARDIAL LESIONS OF SUBACUTE BACTERIAL ENDOCARDITIS, WITH PARTICULAR REFERENCE TO HEALING OR HEALED LESIONS; WITH CLINICAL NOTES.

By E. Libman, M.D.,

PROFESSOR OF CLINICAL MEDICINE, COLUMBIA UNIVERSITY, NEW YORK; ASSOCIATE ATTENDING PHYSICIAN AND ASSOCIATE PATHOLOGIST, MOUNT SINAI HOSPITAL, NEW YORK.

During the last ten years I have been enabled to study an unusually large number of cases of subacute bacterial endocarditis. Particularly in the last few years I have become impressed with the great frequency of the condition (in 1911 I saw 27 cases). Altogether I have had the opportunity of studying at least 89 cases. Blood cultures were made in 75 of 78 active cases—by this I mean cases in what I call the bacterial stage. The other 3 cases were typical clinically; 1 passed out of observation and the other 2 died, autopsies not being obtainable.

Organisms were recovered from the blood of 73 of the 75 cultured cases. In 71 cases the cocci characteristic of the disease were obtained,[1] and in 4 the influenza bacillus. The symptoms and lesions found in the latter group were practically the same as those found in the former, except that thus far the glomerular lesions in the coccus cases have not been discovered in the kidneys of the influenzal cases that have come to postmortem examination.

I shall not now discuss the proper classification of the cocci found in this disease, leaving that for another publication. I shall

[1] Libman and Celler, Amer. Jour. Med. Sci., 1910, cxl, 516, and Trans. Assoc. Amer. Phys., 1910.

simply say here that the cocci we have obtained seem to be identical with those found by other investigators.[2] Until their exact status is determined we shall refer to them as the "endocarditis cocci" or "coccus." Studies by Rosenow indicate that the organisms are derived from pneumococci, a view also discussed in the paper by Celler and the writer.

There were 2 supposedly active cases in which the blood cultures were negative. In the former five cultures were made in a variety of ways in our laboratory, and one in another, all being negative. This patient died at another hospital, and characteristic lesions were found in the heart, with cocci in the vegetations. These cocci were not studied, but I have no hesitation in putting down the case as one belonging in the group of subacute bacterial endocarditis. In the other case two cultures were made, neither very satisfactory. This case died and there was no autopsy made, but the clinical picture was definite.

The term "subacute bacterial endocarditis" I have adopted instead of the older terms: "chronic ulcerative endocarditis," "chronic malignant endocarditis," "chronic infectious endocarditis," and "endocarditis lenta" (Schottmüller). I call all cases of endocarditis already proved to be due to bacteria (rheumatism is not so proved) "bacterial endocarditis," and divide the cases into "acute," "subacute," and "chronic," according to their clinical course. When the causative organism in a given case is obtained, I insert the name of the organism for the word "bacterial," thus, "acute streptococcus endocarditis," etc. Many of the cases that belong in the group with which we are dealing last only four to six months, and are therefore certainly subacute and chronic. Some may prefer to apply the term "chronic" to the cases that last over one year.

Besides the 77 active cases, we have observed 11 cases, which I believe belong in the group of subacute bacterial endocarditis, but in which the lesions found were in a healing or healed stage, and in which the lesions were found free from pathogenic bacteria. In 10 of the cases, blood cultures were made during life (in a few anaërobically), and no bacteria were found. In 1 case as many as nine cultures were made during a period of ten months, all with negative results.

There are many viewpoints from which such large material as I have at my disposal could be presented. I shall attempt in the present communication to show that the lesions found in the cases of subacute bacterial endocarditis in which the mitral valve is involved are quite characteristic. I hope to demonstrate that there are three stages in many cases of this disease: the bacterial, the

[2] Libman and Celler, AMER. JOUR. MED. SCI., 1910, cxl, 516, and Trans. Assoc. Amer. Phys., 1910.

bacteria-free healing, and the bacteria-free healed stage. I should also like to point out that at least some of the cases which we have been wont to call "chronic endocarditis with fever" are examples of the healed or healing forms of subacute bacterial endocarditis, for healing from a bacteriological or bacteriological and pathological standpoint does not necessarily mean recovery from a clinical standpoint.[3]

I shall here present my views as briefly as possible and refer to the literature in so far only as is essential. At another time I hope to cover the subject more fully and to discuss the lesions found in other forms of endocarditis. I shall point out for comparison some of the valvular lesions found in infections by the ordinary streptococci, pneumococci, staphylococci, and the gonococcus.

When the mitral valve is involved in cases of subacute bacterial endocarditis (and it is involved in the larger number of cases) there is a tendency for the vegetations to spread up on the left posterior wall of the auricle more than on the valve itself. Often the chordæ tendineæ attached to the posterior flap are covered to a greater or lesser extent by vegetations. Nearly always the anterior flap is also involved, and here the vegetations tend to grow down over the chordæ tendineæ, the involvement of the latter being often extensive. Not uncommonly the chordæ are ruptured, the torn ends at times being massed together by vegetations at the edge of the flap, or the lower ends may be found lying loose near the papillary muscles. The vegetations are yellowish, greenish, pinkish, or reddish in color, and vary much in size in different cases. As they grow older they become firmer and assume a more grayish color.

When the aortic valves are involved the lesions are not usually characteristic and their extent is most variable. There may be only a small vegetation on one or more of the flaps of the valve. On the other hand, there may be enormous green masses that must block the orifice to a greater or lesser extent. The vegetations have a tendency to extend down over the endocardium at the position of the septum membranaceum and over the ventricular aspect of the aortic flap of the mitral valve and down over the chordæ tendineæ. At times they have a stalactite-like appearance. There my develop an aneurysm of the aortic flap of the mitral valve. Ulceration of the aortic valve at times occurs; ulceration of the mitral flaps is rare.

A study of frequency of involvement of the valves, the left auricle, and the chordæ in the hearts from 34 cases of the disease in which the blood cultures were positive during life was made with the following results:

[3] Libman, Proc. New York Path. Soc., December, 1911, xi, 118.

Auricle, mitral valve, and chordæ	17 cases
Auricle, mitral valve, chordæ, and aortic valve	5 "
Auricle and mitral valve	2 "
Mitral valve and chordæ	1 "
Aortic valve only	3 "
Aortic valve, chordæ, and aortic flap of mitral	4 "
Mitral valve, chordæ, and aortic valve	1 "
Auricle, mitral, and aortic valves	1 "
Total	34 cases

The auricle was involved 25 times, the mitral valve 27 times, the chordæ 28 times, and the aortic valve 9 times. The frequency of the involvement of the chordæ and auricle is very striking.

The lesions which we consider so characteristic of this group of cases we have not found in a large series of cases of acute endocarditis (58 in number) due to the streptococcus, pneumococcus, and the staphylococcus. In our own cases of acute gonococcus endocarditis we have not met with similar lesions. But I have, through the kindness of Drs. Asch and Humphries, of the German Hospital, seen one case of gonococcus endocarditis, apparently of only three weeks' duration, in which the lesions resembled those seen in the group of cases under discussion. The symptoms seen in the typical cases of subacute bacterial endocarditis were not present nor were the characteristic glomerular lesions found in the kidneys.

And as, in the group of 34 cases just tabulated above, only 1 was due to the influenza bacillus and the other 33 to the endocarditis coccus, the lesions must be considered characteristic of infection by these cocci. There are occasional notes in the literature on such lesions in cases of bacterial endocarditis, particularly by Osler[4] and Harbitz.[5] These will be discussed in the fuller paper which will appear later.

After I had made these observations I found (in 1909) lesions in the heart of a man in whose case a clinical diagnosis of chronic nephritis and uremia had been made, which appeared to me to represent the healed form of the lesions I had previously found in cases of infection by the endocarditis cocci. There were extensive lesions on the wall of the auricle in a state of organization, and the chordæ tendineæ attached to the anterior flap were found torn, thickened, fibrous, and in part calcareous. Bacteria were not present. My opinion that these were the healed lesions of subacute bacterial endocarditis (in all probability due to the cocci) was confirmed recently by Dr. Baehr's[6] studies of the kidneys in all the material we have in the museum from cases of bacterial infection of the heart valves.

[4] British Med. Jour., 1885, i, 467, 522, 577, 607; Practitioner, 1893, p. 181; Quart. Jour. Med., ii, 219.

[5] Om. Endokardit, 1897, Christiana; Deutsch. med. Woch., 1899, xxv, 121.

[6] Proc. New York Path. Soc., December, 1911, xi, 123; Jour. Exp. Med., 1912, xv, 330.

Dr. Baehr investigated particularly the glomerular lesions described by Loehlein[7] in cases of endocarditis due to the Streptococcus viridans of Schottmüller,[8] which organism seems to correspond to the cocci found in our subacute cases. Dr. Baehr studied the kidneys of 25 cases of endocarditis due to the endocarditis coccus ("Streptococcus viridans" or "Streptococcus mitis") which were still in the bacterial stage, and found the lesions described by Loehlein in 23. In 2 other cases, 1 an infection by the influenza bacillus and the other the case of gonococcus infection before mentioned (with rather acute course, but with endocardial lesions like those in the coccus case), the lesions were absent.[9] In the kidneys of 54 cases of endocarditis due to the ordinary streptococci, staphylococci, the pneumococcus, and the gonococcus no such lesions were found. The lesions must therefore be considered characteristic of infections of the heart valve by the endocarditis coccus.

In the kidneys of the case which I have just mentioned, which I believed at the time the case came to postmortem examination represented a spontaneously healed case (from the bacteriological and pathological standpoints), the characteristic glomerular lesions were found. After observing this case I again looked over my collection of hearts from cases of subacute bacterial endocarditis, and was surprised to find how often there is a tendency to healing of at least part of the lesions. In a number of cases I found that the upper part of the auricular lesion was already organizing or was organized, while other parts of the lesions were active and filled with bacteria. I also found a tendency to calcareous infiltration in chordæ tendineæ which were covered by vegetations. And even in extensive vegetations on the aortic valve, which on the whole appeared to be quite active, marked calcareous deposits could be found. It was of the greatest interest to observe the transitions between the lesions present in active cases and the lesions we were beginning to find in the cases which I believed to represent healed cases of the disease in question. Including the case mentioned above (Case I) we have now studied the lesions in 11 cases in the last-mentioned group.

Case II.—The clinical diagnosis was chronic endocarditis, chronic nephritis, uremia. In the heart there was an organized lesion of the wall of the left auricle. The chordæ tendineæ were thickened, deformed, some were shortened, some torn. One blood culture was made during life, which gave a negative result. The lesions were bacteria-free; glomerular lesions were found.

Case III.—A case considered to be possibly a case of subacute bacterial endocarditis in which the bacterial infection was no

[7] Med. Klin., 1910, xi, 375.

[8] Münch. med. Woch., 1910, lvii, 617.

[9] Since Dr. Baehr wrote his paper, Dr. Thalhimer has studied with me the lesions in another subacute case due to the influenza bacillus. The glomerular lesions were not present.

longer present. Death was due to exhaustion from anemia and to an embolic aneurysm of the femoral artery. Three blood cultures were made, with negative result. At autopsy there were characteristic lesions of the left auricle and the chordæ, partly organized. There were few poorly staining cocci in the non-organized part of the lesions; they could not be cultivated. Characteristic glomerular lesions were found.

CASE IV.—The clinical diagnosis was chronic endocarditis and chronic nephritis. Characteristic lesions in healing state were found post mortem, bacteria-free. There was no blood culture during life. Glomerular lesions were found.

CASE V.—This case is of particular interest. I had the opportunity of personally observing this patient last summer, in the service of Dr. J. Rudisch. He was a type of case usually termed "chronic endocarditis, with fever." Certain clinical phenomena led me to believe that the case was one of bacterial endocarditis in which bacteria were no longer present, and that the continuance of the clinical phenomena was due to the fact that there was present a large calcareous mass on the aortic valve from which pieces were continually breaking off, the calcareous mass representing the attempt at healing of a large mass of vegetations. At autopsy the conditions were as suspected during life. There was a large calcareous mass present, and there was some ulceration of the valve flaps. As the lesions on the aortic valve are not characteristic in subacute bacterial endocarditis, as those of the mitral usually are, I could not put this case in the group until Dr. Baehr found typical healed glomerular lesions. Two blood-cultures were made in this case; both remained sterile. The masses on the valve were bacteria-free.

CASES VI and VII.—When I thus found that a case with the clinical picture of "chronic endocarditis with fever" could really be a case of bacteria-free subacute bacterial endocarditis I had the kidneys from two other such cases examined. One case had calcareous masses on the aortic valve, an aneurysm of the mitral valve, embolic aneurysm of the iliac artery, and a branch of a renal artery.[10] A few of the chordæ tendineæ attached to the anterior mitral flap showed organized vegetations. Three blood cultures were negative in this case. The lesions post mortem were free from bacteria, and typical healed glomerular lesions were found by Dr. Baehr. The other case presented at postmortem examination calcareous masses on all three flaps of the aortic valve, with some ulceration of the valve. There was also an aneurysm at the position of the membranous septum. Death was due to cerebral embolism. Three blood cultures in this case

[10] It is interesting to note, in view of the clinical remarks appended, that when I looked up the history of this patient, who was in the hospital seven years ago, the house physician had made a note that there was facial pigmentation and a palpable spleen.

revealed no bacteria. Healed glomerular lesions were easily found. It is of great interest to compare the heart in this case with another in my collection in which there are vegetations on all three flaps of the aortic valve. Although there are cocci present, and they were still to be found in the blood at the time of death, distinct calcareous impregnations are present. It is easy to see that this heart might easily look like the one from the bacteria-free case if the process of calcification were further advanced.

CASE VIII.—This case was suspected of being in the bacteria-free stage of subacute bacterial endocarditis. One blood culture was made, with negative result. There were slight organized lesions of the aortic valve. There was a granular lesion of the left auricle and the chordæ tendineæ showed typical changes, but in an organizing or organized condition (histological studies not complete). There were no bacteria in the lesions.

CASE IX.—This case was also strongly suspected clinically of being one of subacute bacterial endocarditis, that had become bacteria-free. The cause of death appeared to be a cerebral embolism. The autopsy showed a slight healed lesion of the posterior flap of the mitral valve. The chordæ tendineæ attached to this flap showed apparently organized vegetations (histological examination not completed). The changes in the anterior flap were like those seen in active bacterial cases of disease; the chordæ tendineæ were matted together at their attachment to the valve, and some of them were torn across. All these lesions appeared to be organized. There was one finger-like vegetation attached to the cusp, which hung down into the ventricle as far as the insertion of the chordæ into the papillary muscle. This vegetation did not seem to be as old as the others. The aortic flaps showed very small vegetations, and one cusp was slightly ulcerated. Three blood cultures were made, all with negative results. The lesions were found bacteria-free; glomerular lesions were found.

CASE X.—This case was also suspected clinically of being one of the remarkable instances of healing endocarditis when the patient was in the hospital in December, 1911. A blood culture taken at that time showed no growth. He returned in March, 1912, with an embolism (embolic aneurysm?) of the right brachial artery. Two blood cultures were negative. At the autospy the usual lesions were found that are characteristic of subacute bacterial endocarditis when the mitral valve is attacked. The lesions seemed to be nearly if not entirely organized (examination not finished). There was one unusual lesion, an old ulceration of the posterior flap of the mitral valve. The vegetations were found bacteria-free. The heart blood contained saprophytic bacteria only. Glomerular lesions were easily found.

CASE XI.—This case was observed much longer than any other case in this group. The patient was constantly seen for nearly

ten months, and was several times under observation in the hospital. In all nine blood cultures were made, some being incubated anaërobically (this was also done in several of the other eleven cases now under discussion). Not a single colony of an organism was found. The man died of anemia, exhaustion, and decompensation. At the autopsy there were found extensive deposits of calcareous, fibrous, and thrombotic material on the flaps of the aortic valve. There were perforations of the valves with healed margins; these were clearly due to ulceration. There were also present aneurysms of the sinuses of Valsalva. Spreads of the vegetations proved bacteria-free. Cultures of the heart blood showed the ordinary streptococcus, evidently a terminal or agonal invader. The kidneys showed the typical glomerular lesions all healed.

I wish to digress for a moment here to mention a further finding which to me seems important and to which hitherto no attention has been paid. This patient had the sternal tenderness which I described in an earlier paper[11] as being such a frequent, valuable symptom in subacute bacterial endocarditis, and he had it to an unusually marked degree. I had suspected that it was due to active regeneration in the bone marrow, this being an effort at compensation for the marked progressive anemia so common in the disease. There was another possibility to be entertained, although it was less likely—namely, embolic disease of the bone marrow.

When we performed the autopsy in this last case we were able to obtain bone marrow from the tibia, femur, and sternum. In the femur and sternum and in the middle of the tibia the marrow was dark brownish red in color, and very firm. It is now being studied histologically.

We have then before us 11 cases in which we have every reason to believe that we are dealing with cases in which patients who had a subacute bacterial endocarditis overcame the infecting agent without their having been seen at a time when the infection was still active. In 1 poorly staining cocci were still seen in small numbers in part of the lesions. In 7 of the cases the mitral valve was involved in a way seen practically only in subacute bacterial endocarditis. As 95 per cent. of our active cases were found to be due to the endocarditis coccus, it is fair to assume that nearly all of the 7 cases were due to the coccus. Besides which we have further evidence in the presence of the characteristic glomerular lesions in all of them.

One case had a calcareous mass on the aortic valve and involvement of the chordæ tendineæ in characteristic fashion. The latter lesion is in itself suggestive, and besides this typical glomerular lesions were found.

We have left 3 other cases in which only the aortic valve was

[11] Amer. Jour. Med. Sci., 1910, cxl, 516.

involved and in which large calcareous lesions were found. In all of these we have the proof afforded by the presence of the glomerular lesions that they were almost surely the result of infections by the endocarditis coccus. And I have pointed out that there are transition stages to these lesions in cases which still have the cocci in the blood during life and in the lesions.

It is of interest to note in the cases with aortic involvement (calcareous masses on the valve) that aneurysms are frequent and that they are of a different type from the bacterial embolic type. One finds aneurysms of the sinuses of Valsalva, the heart wall just below the aortic valve, the aortic flap of the mitral valve, and in the peripheral arteries. All except the last seem to be due to impact by the calcific material on the valve. They are all smooth walled. The peripheral aneurysms seem to be due to the traumatism to the wall inflicted by a piece of lime whipped off from the valve. Some years ago I pointed out that such non-infective embolic aneurysms actually existed.[12]

The question will now be asked, How often does one see a case of subacute bacterial endocarditis in which blood cultures have been positive, become bacteria-free and go on with symptoms due to the changes left in the heart or recover completely? As regards this point, our own experience has been that nearly all the cases in which we found bacteria in the blood and which we could follow went on to a fatal termination, with bacteria still present in the blood. In but few cases did the blood cultures become negative; these patients also soon succumbed. In one case of infection by the influenza bacillus five blood cultures were positive and four later ones were negative. This patient died a couple of months after leaving the hospital, or about four months after the cultures became negative. He left the hospital quite anemic, and died of exhaustion and decompensation. An autopsy was not permitted. Our experience coincides with that of those who have seen large numbers of these cases. The instances of recovery in cases with positive blood cultures will later be cited briefly in the discussion of the literature.

It is curious in view of the facts just stated that there should exist so many cases[13] which must have had a bacterial infection, have recovered from the infection, and have certain clinical pictures from the changes brought about during the infective period. We must assume that in these cases the period of bacterial infection was very short as compared to the cases which we see with bacteria in the blood or very short and very mild. When one sees cases of

[12] Proc. New York Path. Soc., October, 1905, p. 88.

[13] I have seen a number of cases besides those mentioned in the text which I believed to be examples of bacteria-free cases. Some have disappeared from observation. A few I am still following. I believe we will be surprised at the number of such cases that exist and have hitherto not been properly interpreted.

the disease with bacteria demonstrable in the blood go about for weeks with hardly any symptoms it is not difficult to believe that some patients with a mild or short infection may not feel sick enough to ask for medical attention or present such mild clinical pictures that they are not put to bed. That the infection in such cases is a shorter one is also suggested by the study of the glomerular lesions. They were found to be much more abundant in cases in which cocci had been found in the blood than in those in which they were never demonstrated. It is not my purpose in this communication to discuss at length the clinical pictures presented by the cases with healing or healed lesions. A sufficient number of cases has not yet been collected to give us a clear idea of the complete course of such cases. It will be important to determine how long people with this condition can live, and whether any of them after the bacterial infection is over can live for many years with no other symptom than those they had from their original valvular lesion before the infection was superimposed. My own data are too few to give any definite facts. But two observations are of some value. One case (Case XI) was observed in a bacteria-free condition almost ten months. In Case X a transfusion prolonged the patient's life. I have another case under clinical observation who has but few symptoms, who is in no worse condition today (perhaps even better) than he was ten months ago.

As far as the data which I have thus far at my command go they indicate that the cases with healing or healed lesions present the following clinical pictures:

1. They go on to have a nephritis and die of uremia.

2. They present the picture corresponding to what we have been wont to call "chronic endocarditis with fever" (that is they have a valvular lesion, more or less fever from time to time, usually low, occasional petechiæ,[14] occasional joint symptoms, and embolisms). Some of these cases closely resemble cases in which bacteria are demonstrable in the blood. The differences will be discussed when I have more material. Some of these patients are pale and some more or less pigmented (see below).

3. Some of these cases present a clinical complex that appears to have been entirely overlooked. The striking feature is a peculiar diffuse brown (sometimes quite dark) color of the face. The rest of the body may show some pigmentation. There is evidence of a valvular lesion, there is more or less anemia, usually a palpable spleen, and usually also tenderness of the lower sternum.[15] The patients feel weak and do not sleep well. Petechiæ occasionally

[14] My investigations go to show that purpuric eruptions occur particularly in the cases with calcific masses in the valves.

[15] This symptom will be more fully discussed in a separate publication, as will also the changes in the urine.

occur. There is temperature from time to time, but usually low. Erythrocytes are found in the urine in some of the cases. The subsequent history of such cases is not yet known; one case died with symptoms of cerebral embolism. I wish particularly to emphasize the curious change in the color of the face. It will, I am sure, be of great importance in the recognition of some of the cases with healing or healed lesions. Since I have observed it in such cases I have looked for it in cases with bacteria in the blood. And now, to my surprise, I find that while the faces of most of the cases are sallow, or of a rather white color, some develop a certain amount of brown or *café-au-lait* color.

4. They may go on with more or less anemia, and suffer from that and from decompensation.

I would like now to note a few of the important symptoms that occur in the bacterial cases and state what my experience is as regards them in the cases in which the infection has been overcome:

1. Fever: This is found in all of the non-bacterial cases that we have observed, but it is a less marked feature and the temperatures are low for much longer periods. In an earlier paper I have drawn attention to the fever which occurs in cases of chronic endocarditis without demonstrative bacteriema.[16] At that time I made the following remarks: "There are many cases of chronic endocarditis with fever without demonstrative bacteriemia. In some cases causes for the fever may be found elsewhere in the body. If no cause can be found the acute symptoms may be due possibly to organisms not to be cultivated by our present methods. I have suspected that in some cases with irregular fever, at times high, and recurring from time to time, the temperature may be due to the discharge into the blood current of bits of thrombotic masses or old vegetations." Bock[17] has recently shown that fever can be produced experimentally by the injection into the blood stream of bacteria-free, chemically indifferent particles.

2. Splenic Enlargement: This symptom seems to persist in the non-bacterial stage. I have reason to suspect that occasionally when the spleen is very large, the clinical diagnosis may appear to be a splenic disorder plus chronic endocarditis. In the bacterial stage, it is well known that the splenic enlargement may be so marked that such cases have been mistaken for cases of Banti's disease or splenic anemia.

3. Pains: These may be just as severe in the bacteria-free cases; the same holds true of joint pains.

4. Painful Cutaneous Erythematous Nodules: These were not observed in the bacteria-free cases except in one case, in which

[16] Libman, Johns Hopkins Hosp. Bull., 1912, p. 222.
[17] Bock, Arch. exp. Path. u. Pharmakol., Band lxviii, 68, I.

they were a prominent feature during the early period of the observation.

5. Sternal Tenderness: This symptom, on which I lay much stress, is equally frequently met with in both groups of cases. It even seems to be a more marked symptom in the bacteria-free cases. As I have stated in an earlier publication,[18] sternal tenderness may be found even when the hemoglobin is not markedly reduced.

6. Petechiæ: These occur in the bacteria-free cases, but are not as abundant and do not occur so frequently. Purpuric eruptions seem to be a feature rather of some of the bacteria-free cases.

7. Hematuria: This subject needs further investigation. Erythrocytes were found in the urines of those cases of the bacteria-free groups in which they were carefully looked for. Gross hematuria—that is to say, smoky urine—I remember to have seen only once in the cases in the bacteria-free group, and it occurred in that case only during the early part of the period of observation.

Other symptoms, such as the sweats, the blood changes, the gastrointestinal phenomena, etc., will be discussed when more data are available. The facts that I have given show the close resemblance between many of the features in the two groups of cases. It is important that we can recognize at least some of the bacteria-free cases definitely. It will be of great value to search for such cases and to make studies of the serum in them. Complement fixation investigations carried on in connection with such cases may enable us to determine the exact status of the cases classed as chronic rheumatic endocarditis. We may be able to ascertain whether there exist cases that have had the bacterial infection and have completely recovered, being left with the original valvular lesion due to rheumatism.

It will finally be of interest to glance at the literature on the subject of healing of the lesions of subacute bacterial endocarditis. I shall take up at the present time mainly the experience of authors who have had the advantage of having blood cultures made in their cases. I shall not go into the question of the possibility of the healing of acute endocarditis; Herrick[19] has discussed that subject fully.

Litten,[20] Leyden,[21] Osler,[22] and Rosenow[23] do not record any experiences with healed cases. Leyden believed that it was possible for "ulcerative" endocarditis to heal. He evidently had instances of subacute bacterial endocarditis among the cases he studied, but none with healed lesions.

[18] Amer. Jour. Med. Sci., 1910, cxl, 516.
[19] Trans. Assoc. Amer. Phys., 1902, xvii, 48.
[20] Berlin. klin. Woch., 1899, p. 609, 644; Deutsch. med. Woch., 1902, p. 369, 395.
[21] Zeitschr. f. klin. Med., iv, p. 321.
[22] Loc. cit.
[23] Jour. Infect. Dis., 1909, vi, 249.

Harbitz,[24] in the report of his admirable investigations on endocarditis, discusses lesions that he found in 10 cases that he believes were related to "chronic infectious endocarditis," and in which the lesions were in a healing stage.[25] He says that he did not succeed in obtaining bacteria in these lesions, but the anatomical picture, "the extension to the walls of the auricle and ventricle, the excrescences on corresponding parts of two adjacent flaps, the tearing of chordæ tendineæ," etc., was quite characteristic. These cases ran a long course, at times associated with subacute nephritis. In one case of this group in which the cultures at the autopsy were sterile, Peter Holst obtained two weeks before death a "white staphylococcus" in the blood. In a few cases indistinct groups of organisms were found in sections and smears made from vegetations, and the cultures were negative. These observations of Harbitz are the most definite hitherto recorded.

Bartel[26] made a study of 22 hearts from cases of endocarditis to determine whether "ulcerative" endocarditis is capable of healing and how often it occurs. His Cases IV and VII resemble much some of the cases I have described. He discusses the possibility of relapses of infection due to bacteria lying dormant in healing or healed lesions, a subject to which I have alluded in an earlier publication,[27] and which is worthy of further study.

Lenhartz[28] states that none of his cases recovered. One case that left the hospital after the fever had disappeared, and the blood was free from bacteria, died ten months later of cardiac insufficiency. Horder[29] saw only one recovery in 150 cases of endocarditis due to all kinds of bacteria. The patient was a boy, aged fifteen years, who had fever for seven weeks. He eventually lost all evidences of cardiac disease. This observation loses in value because no blood cultures were made.

Latham and Hunt[30] describe the case of a man who was under observation from August 24, 1909, to November, 1910. They obtained a coccus from the blood, which may very well correspond to the endocarditis coccus, seven times between October and July. There was irregular fever and repeated embolisms. From April on there was gradual improvement. When the patient was seen in November, 1910, the temperature had been normal or subnormal for several months, the pulse rate was 60, and the heart was regular. The mitral systolic and aortic diastolic murmurs persisted. The last three blood cultures were negative. The authors make a note that the polynuclear percentage dropped

[24] Loc. cit.
[25] I am indebted to Dr. Baehr for drawing my attention to these 10 cases described by Harbitz.
[26] Wien. klin. Woch., 1901, p. 1004.
[27] Libman, Johns Hopkins Hosp. Bull., 1906, xvii, 223.
[28] Die septischen Erkrankungen, Wien, 1904, p. 434.
[29] Quart. Jour. Med., ii, 289.
[30] Proc. Royal Soc. Med., Clin. Sec., November 11, 1910, p. 14.

from 74 to 54 in the course of the case. I have a number of times seen lymphocytic increase in subacute bacterial endocarditis, in cases with and without bacteria.

They ascribe the recovery to the use of an autogenous vaccine administered by the mouth. As one so often sees spontaneous disappearance of the bacteria, this case may very well have become bacteria-free without the use of the vaccine. Vaccines have been used by many competent observers in these cases without any beneficial effect.

Emerson and Harrison[31] describe a case supposed to be one of the group under discussion, but it does not seem to me to be a case of subacute bacterial endocarditis.

Schottmüller,[32] in 1910, described 5 cases of subacute bacterial endocarditis ("endocarditis lenta"), and stated that 1 was still under observation and was doing well. The other 4 died. He has not reported since that time on the case that he believed was recovering.[33]

Jochmann[34] has recently reported 7 cases of the disease, 2 of which recovered; 3 of the cases were treated with an autogenous vaccine and with a serum produced by immunizing animals with cultures of the "Streptococcus viridans." Two of the patients so treated died. So that 1 case recovered on the use of specific treatment and 1 without it. It is to be hoped that the subsequent course of these 2 cases will be reported.

Some time ago I came across a reference to a case mentioned by Reiche, of Hamburg, at a meeting. He had a case of subacute bacterial endocarditis of the aortic valve in which the blood cultures became negative after they had shown cocci a number of times. The patient died of an embolic aneurysm of an intrahepatic branch of the hepatic artery which had ruptured into the liver substance and caused a fatal hemorrhage into the peritoneal cavity. The endocardial lesions, Reiche stated, were found healed. It is unfortunate that no further data are given as to bacteriological studies of the involved valve, and no accurate description of its appearance.

It will be noted that the observations on the healing of subacute bacterial endocarditis are rather few in number. From the pathological standpoint those of Harbitz are the most illuminating. From the standpoint of healing in a clinical sense the observations of Latham and Hunt and Reiche and Jochmann are important. It is essential that writers who in future report such cases give subsequent reports on the condition of the patients, with reference to the clinical points I have discussed in the body of this paper.

[31] Jour. Royal Army Med. Corps, 1910, xv, 588.

[32] Münch. med. Woch., 1910, p. 880.

[33] July 31, 1912. Since this paper was written, I have heard from Professor Schottmüller that this case has succumbed.

[34] Berlin. klin. Woch., 1912, p. 436.

It seems remarkable that the cases that have spontaneously become bacteria-free have hitherto escaped detection.

I believe I have brought forward sufficient evidence to prove that subacute bacterial endocarditis is a disease in which healing can occur from the bacteriological, pathological, and clinical standpoints, although the evidence of complete recovery from the clinical side is still very meagre.

It is a pleasant duty for me to express my gratitude to Drs. Rudisch, Meyer, Brill, and Manges, the visiting physicians to Mount Sinai Hospital, for their kindness during many years in permitting me to make studies on their cases. The clinical data are mainly derived from the cases in the service of Dr. Rudisch and from cases which a number of physicians permitted me to observe in their practice. I wish to add that it would not have been possible to complete the bacteriological and pathological studies as far as they have been carried without the enthusiastic assistance of the various members of the laboratory staff for the last ten years.

GLOMERULAR LESIONS OF SUBACUTE BACTERIAL ENDOCARDITIS.[1]

By George Baehr, M.D.,

Assistant in Pathology, Mount Sinai Hospital, New York.

In the kidneys of nearly all individuals dying during the course of subacute bacterial endocarditis there exists a pathological lesion which affects one or more loops of a variable proportion of the glomeruli.[2]

The first to draw attention to this lesion and to connect it with infections of the endocardium by the endocarditis coccus (Streptococcus viridans) was Loehlein. In March, 1910, he reported 8 cases of this condition, in all of which loops of some of the glomeruli showed the lesions. Three of these showed organisms in blood cultures taken during life, and in one of these, organisms were cultivated from vegetations post mortem. In one case the lumen of an artery entering an infarcted area was occluded by an embolus which contained numbers of cocci.

Before proceeding to a consideration of the glomerular lesions it is necessary to understand a few of the cultural characteristics of the endocarditis coccus in order to be able to appreciate the mechanism by which the kidney lesions are produced. On the

[1] Read by invitation at the meeting of the Association of American Physicians, May 15, 1912.

[2] Baehr, Jour. Exp. Med., xv, 330.

surface of agar, its growth is exceedingly dry and sometimes difficult to remove. When an attempt is made to emulsify this growth in normal salt solution, the bacteria show a very marked tendency to hang together in small firm clumps which usually cannot be broken up even by very vigorous shaking.

Smears made from pieces of vegetations in these cases when squeezed between slides and stained by Gram's method, usually show the presence of the typical cocci in numbers such as are seen only in smears made from pure cultures. It is quite conceivable, therefore, that large numbers of these clumps are constantly being washed off the vegetations by the blood current, and being just small enough to pass the vasa afferentia in the kidney, become lodged in the capillary loops of the glomeruli.

In the kidneys of individuals dying during the active bacterial stage of the disease there are seen, as a rule, all stages of the glomerular lesions. The number of involved loops of a glomerular tuft varies in the different diseased Malpighian bodies. Furthermore, there is a great variation in the relative number of glomeruli involved in different parts of the kidneys. The uninvolved glomeruli and the uninvolved loops of involved glomeruli show no changes.

The very earliest stage of the process appears to consist of a swelling of the glomerular epithelium in the involved loops. This may be situated at any portion of the glomerular tuft. If the lesion is large, a segment of the glomerulus, or even the entire Malpighian body may be involved by the process. At first the outlines of the swollen epithelial cells in the diseased segment can be made out. Subsequently they are lost and the entire structure is fused into a homogeneous, finely granular material. In this mass some of the nuclei are fading or undergoing karyorrhexis, although a few may still remain fairly well preserved.

If the deep staining, finely granular mass is situated at the periphery of the glomerulus, the epithelium of the visceral layer of Bowman's capsule over the involved part is usually found to be swollen, proliferating, and desquamating into the capsular space. When the mass with its overlying epithelium comes into contact with the parietal layer of Bowman's capsule, the latter then probably also takes a share in the desquamation, and perhaps in the proliferation.

Eventually this epithelium undergoes necrosis, as did the previously swollen epithelium of the involved loops of the glomerulus. It also becomes part of the homogeneous, finely granular mass which now fuses with the parietal layer of Bowman's capsule. At this stage, the mass may become flattened out over the area of fusion with Bowman's capsule in a crescentic fashion.

The homogeneous cellular material is seen to be traversed by a very delicate network. Eventually the entire mass becomes

thoroughly organized. At the same time there occurs active growth of the epithelial cells of the adjacent intact portions of the parietal layer of Bowman's capsule. They advance over the inner aspect of the necrotic mass which by this time has usually separated somewhat from the rest of the glomerulus. Eventually the entire lateral surfaces of the mass are covered by this invading epithelium.

The healed stage of the lesion presents the following picture: A hyaline mass having roughly the shape of a truncated pyramid; its base fused with the adjacent interstital tissue; its mesial aspect adherent to the remainder of the glomerulus; its sides clothed by a reflection from the adjacent epithelium of Bowman's capsule.

When the entire glomerulus is involved, the peripheral portion may be seen to be replaced by concentric fibrils of connective tissue, whereas the central portion still consists of a homogeneous material. In the same section, however, examples of even later stages are frequently seen, the glomerulus being entirely replaced by a mass of hyaline fibrous tissue.

Practically every stage of the process described above is to be seen in nearly every microscopic section of the kidney cortex from most of the cases, and this association of the various stages is an important part of the pathological picture.

The typical lesions were found in 23 of the 25 cases due to the endocarditis coccus. In 2 cases, 1 of which was due to the influenza bacillus and 1 due to the gonococcus, the lesions were not found. The percentage of glomeruli involved varied from 2 to 75 per cent. in various cases.

In sections of 5 cases in which portions of the kidneys were fixed in alcohol, Gram-Weigert stains demonstrated bacterial emboli in the capillaries of the glomeruli. In 2 cases they were easily found; in the other 3, they were only discovered after prolonged search.

The changes that occur in the tubules and interstitium and in the end may lead to a picture identical with that of the secondary contracted kidney are discussed in the paper already referred to. In the same paper will be found a description of the atypical lesions which were found in 2 cases and which closely resembled the lesions found in subacute glomerular nephritis.

In 54 cases of acute endocarditis due to the ordinary pathogenic bacteria, none of the glomerular lesions were found in any case. In the cases which Dr. Libman has described as being instances of a healed or bacteria-free stage of subacute bacterial endocarditis; the characteristic lesions were found every time, only the healed stage of the lesion being present. In these cases the lesions were less abundant than in cases in which the endocarditis coccus had been found during life or after death.

THE RELATION OF HYPERTENSION TO URINARY EXCRETION.

By Charles H. Lawrence, Jr., M.D.,
ASSISTANT VISITING PHYSICIAN, MASSACHUSETTS GENERAL HOSPITAL, BOSTON, MASS.

(From the Henry P. Walcott Fellowship, Harvard Medical School, and the Massachusetts General Hospital.)

When Bright[1] described the condition now known as cardio-renal disease he advanced the following theory to explain the cardiac hypertrophy and increased tension of the pulse which he recognized as characteristic of the condition. There occurred, he thought, a change in the quality of the blood by virtue of which it acted as a stimulus to the heart, causing it to beat more forcibly, and thus hypertrophy, with resulting increase in the force of the pulse. Further, he considered it possible that the blood might act upon the capillaries, causing them to contract and thus demand greater work from the heart in forcing the blood through them.

Opposed to Bright's theory is that of Traube,[2] which is purely mechanical. According to this theory the destruction of vessels in the damaged kidneys causes (1) a diminished rate of outflow from the aorta, and (2) an increased resistance to the outflow from the renal arteries. Then follows permanent high tension and cardiac hypertrophy.

Cohnheim's[3] theory in some measure combines the ideas advanced by Bright and Traube. He states that the caliber of the renal vessels, great and small, depends upon the amount of urinary constituents (urea, water, etc.) present in the circulating blood. If these become increased a contraction of the vessels takes place. Under these conditions, if the amount of blood passing through the kidneys is to remain unchanged a rise in pressure, compensatory in nature, must follow.

Cohnheim's theory has been most generally accepted, and the present belief concerning the nature of hypertension has for its fundamental concept the compensatory role of increased blood pressure. The influence of Bright remains in the belief that in nephritis the blood does contain some toxic material of an as yet unknown nature.[4]

It is toward the elimination of this unknown toxin that treatment is principally directed, and little attention is paid, from a therapeutic standpoint, to the arterial tension. The diet, low in proteid, the hot air baths, the vigorous catharsis, and in selected cases

[1] Quoted by Senator, Zeitschr. f. klin. Med., 1911, lxxii, 189.
[2] Ibid.
[3] Allgemeine, Pathologie, 1882, ii, 357.
[4] Quarterly Jour. Med., 1909, ii, 231.

venesection, all aim toward the elimination of toxic material. Restriction of fluid intake has for its purpose removal of edema by reabsorption and elimination through the bowel or skin. Cardiac decompensation is combated with digitalis.

There can be no doubt that these measures do cause an increased general elimination from the body (though the amount of toxin removed must remain an open question until it is identified). There is equally little doubt that with the exception of digitalis they cause a fall in blood pressure. In a previous paper the writer has tabulated observations as to the effect of most of these measures upon systolic and diastolic pressure. The results show that with the exception of the administration of digitalis all the measures mentioned above cause a diminished arterial tension in the majority of cases. It has long been held that digitalis causes an increase in blood pressure, but in a recent article Cushney[5] states that he was surprised to find that the increased tension caused by digitalis in animals did not obtain in a large series of human patients whom he had observed.

Here then exists a conflict. It is generally believed that high blood pressure is a protective reaction in renal disease. The treatment of such disease, while principally directed toward the elimination of toxic material from the body, has a depressing effect on blood pressure. Are the good results ascribed to the treatment entirely due to its eliminative effect, and do they occur in spite of its depressing action upon the protective hypertension? Or is the lowering of the abnormally high tension responsible for some of the improvement noted? In short, is hypertension in nephritis essentially protective, or is it merely an evidence of the action of a circulating toxin upon the vessels?

According to Conheim it is protective in nature. Its purpose is to force the blood in undiminished amount through kidneys which offer increased resistance to its passage. Experimental evidence, however, raises objections to this theory.

Senator[6] has shown that ligature of the renal artery or extirpation of the kidney does not cause a rise in arterial pressure.

Objection has been raised to this maneuver by Katsenstein,[7] who states that complete ligation of the renal artery does not have the same effect as a marked but incomplete narrowing of its lumen. In his experiments on dogs he found that the latter operation always caused a rise in arterial pressure, never amounting to more than 10 mm. of mercury. Senator, however, was unable to confirm these results and found that there was no greater rise in pressure than when the femoral artery was similarly treated.

Under Senator's direction the following experiments were carried out. Animals were narcotized with urethran to eliminate sensory

[5] Amer. Jour. Med. Sci., 1911, clxi, 469.
[6] Zeitschr. f. klin. Med., 1911, lxxii, 189.
[7] Virchow's Archiv, 1905, clxxxii, 327.

stimuli as a factor in raising the pressure. Paraffin was then injected into the kidneys, completely "infarcting" those organs, as autopsy later showed. "The blood pressure measured in the carotid artery showed no rise, even at the end of an hour." From these experiments Senator concludes: "In so far as one can argue from cats to man I believe it conclusively shown that through damaging the blood flow to the kidney parenchyma, with unhindered flow to the renal artery, the pressure in the aortic system is not raised."

The effect of high pressure upon the volume of blood passing through the kidneys has been studied by Burton-Opitz, and Lucas.[8] They measured the volume of blood flowing through the kidneys of animals in a unit of time during which the pressure in the arterial system was normal. The general pressure was then raised, and the volume flow through the kidney again recorded for a similar length of time. The observers found that in "by far the largest number" of experiments there was no increase in the flow of blood through the kidney, "even at a time when the very pronounced rises in arterial pressure had fully developed." In a number of experiments they found that the increased pressure was accompanied by a diminution in the volume of blood flowing through the kidney.

Schlayer and Hedinger[9] carried out a series of similar experiments. They, however, measured changes in the kidney volume instead of changes in the blood flow. They found that a rise in blood pressure due to sensory stimulation or to administration of adrenalin was accompanied by a diminution in kidney volume, while caffeine caused a dilatation of the renal vessels and a resultant diuresis. They further found that in toxic nephritis there was a loss of power of dilatation of the renal vessels and a loss of diuretic action from the above drug. The loss of contractile power of the renal vessels was slight or none.

Von Passler and Heinecke[10] removed successive small amounts of tissue from the kidneys of dogs and studied the effects of the loss of substance upon blood pressure and upon elimination of urine. They conclude that the polyuria observed in nephritis is independent of blood pressure, but bears a direct relation to loss of kidney substance.

Fischer[11] in a research upon causes of edema performed the following experiments: A filter of colloid material was inserted in an artificial circulation scheme through which fluid was pumped under varying but known degrees of pressure. The colloid substance of the filter was acidulated to varying but definite amounts. The amount of fluid passing through the filter and that returned

[8] Jour. Exp. Med., 1911, xiii, 308.
[9] Deut. Arch. f. klin. Med., 1907, xc, 1.
[10] Verhand. der Deutsch. pathol. Geschell., 1905, ix.
[11] Edema, 1911.

by it in a unit of time were determined. The results showed that the acidity of the filter was the paramount factor in determining the amount of fluid retained by it, and that any effect obtained by increasing the pressure behind the filter could be vitiated by increasing the acidity of the colloid material. From these results it is suggested that the affinity of cells for water, determined by their chemical composition, controls the amount of urine excreted, while the pressure behind the kidney is of secondary importance.

To sum up: Experiments on animals show that (1) high blood pressure is not caused by increased resistance to the flow of blood through the kidney; (2) that it does not cause increased flow through those organs, and (3) that it is not the cause of the polyuria so often seen in that class of kidney disease, commonly accompanied by hypertension.

Opposed to the conclusions drawn from experiments on animals stands the opinion, often expressed by clinical observers, that hypertension is nature's way of protecting the organism against the deleterious effects of damage to the kidney. This opinion is derived from the observation of large numbers of patients. Moreover, it has often been observed that when such patients suffer acute exacerbations the systolic pressure is less high than during the periods of comparatively good health. In the experience of many careful observers an attempt to lower the blood pressure by the use of vasodilators causes headache, dyspnea, and other symptoms characteristic of uremia. For these reasons it is believed by many that hypertension existing for years tends to protect the organism from the result of diminished renal activity, and that when the heart can no longer maintain the pressure at a sufficient height the patient suffers from uremia.

Scattered through the literature are reports that disagree with this theory. Thus Gibson[12] states, "If there is considerable increase (in pressure) in acute nephritis the prognosis is less favorable than when there is no rise at all," and in the same article, "A rise in pressure above what has been found to be the normal for the case is very commonly the herald of uremia."

Miller[13] reports the following case: A patient entered the hospital having uremic convulsions; blood pressure, 200 mm.; twenty-four hour amount of urine, 600 c.c. Under treatment the pressure fell to 130 mm., the convulsions disappeared, and the twenty-four hour amount of urine rose to 1700 c.c. There was no change in the amount of fluid ingested.

Kinnicutt[14] states, "The power of nitroglycerin to control or relieve many of the paroxysmal disturbances of the nervous system included under the general term uremia was more marked than that of opium or chloral."

[12] Edinburgh Med. Jour., 1911, vi, 197.
[13] Jour. Amer. Med. Assoc., 1910, liv, 1666.
[14] Med. Record, 1886, xxix, 255.

Dana[15] cites 6 cases of renal disease and 5 normal cases in which administration of nitroglycerin was followed by diuresis.

Elliott[16] sums up the situation as follows: "As a matter of fact there is no certain correspondence between the amount of urine excreted and the degree of blood pressure. The administration of a nitrite to lower blood pressure will as often be attended by an increase as by a fall in the amount of urine.

A. Loeb[17] holds the same theory, but on the basis of 3 cases in which the administration of nitroglycerin was followed by a fall in the amount of urine decides that lowering the pressure has a deleterious effect upon renal activity.

The evidence obtained by careful observation of cases is most valuable. From it must be made the final decision as to the validity of any theory founded upon experiments on animals. Many conditions occurring in man cannot be exactly reproduced in animals. Among them is cardiorenal disease. Therefore the results of animal experimentation are less convincing in this condition than in many others. More important and convincing are observations carried out on human beings under circumstances artificially produced and therefore accurately estimated.

Among such observations the most extensive are those of Erlanger and Hooker,[18] made with the aid of an instrument devised by Erlanger. They made numerous observations on the relation of circulatory conditions to renal activity. The subjects were two medical students: one a normal individual, and one suffering from orthostatic albuminuria. On the basis of their experiments they conclude that no relation can be discovered between the output of urine or albumin and the blood pressure, either systolic or diastolic. They conclude that the amount of urine excreted by the individuals studied varied directly as the pulse pressure, that is, the difference between systolic pressure and diastolic pressure. Hooker[19] working alone later obtained similar results. His experiments were performed upon isolated kidneys, but his results are similar to those reached by Erlanger and himself.

The conclusion of these writers based upon a large number of careful observations are at variance with the results of clinical observation. The individuals observed, however, did not have abnormally high blood pressure. Therefore, it is unsafe to conclude from them that hypertension does not increase the amount of urine excreted by nephritic kidneys. The results do suggest such a possibility, however, and in conjunction with the work of Fischer, already cited, form a basis for an hypothesis, that hypertension in nephritis does not aid urinary excretion. If this be the case,

[15] Med. Record, 1886, xxix, 255.
[16] Amer. Jour. Med. Sci., 1910, cxl, 6.
[17] Deutsch. Arch. f. klin. Med., 1905, lxxxiv, 579.
[18] Johns Hopkins Hosp. Rep., 1904, xii, 145.
[19] Amer. Jour. Phys., 1910, xxxvii, 24.

the idea that it is a protective reaction loses much of its support, and the theory that it represents merely vascular spasm becomes strengthened.

One important piece of evidence is lacking—that obtained by accurate observation of human beings suffering from nephritis and hypertension under conditions which could be varied at the will of the observer, and thus more accurately estimated than is possible under the usual conditions.

It was in the hope of supplying some part of this evidence that the work reported here was undertaken. Its purpose was to ascertain whether a large number of observations would show any definite relation between the excretion of urine and the changes in systolic and diastolic blood pressure or pulse pressure occurring in individuals suffering with chronic nephritis. Observations were made upon 20 patients, all of whom had polyuria, albuminuria, cardiac hypertrophy, and an average systolic pressure of over 180 mm. of mercury. During the entire period of observation the daily amount of liquid intake and urinary output was measured and recorded. The diet was not materially changed during the observations. As far as possible drugs were administered one at a time, and the effect of each studied before another was added. No results were recorded which were obtained before blood pressure, urinary excretion, and elimination by the intestine had recovered from the wide variations seen during the first days of a patient's stay in the hospital and had approximated a daily level. Blood pressures were estimated with a Faught mercury manometer equipped with a cuff 12 cm. wide.

Systolic pressure was estimated at the point at which the first returning pulse beat was palpable after all pulsation had been obliterated. Diastolic pressure was estimated by the auscultatory method.[20] The estimations were made twice daily: in the middle of the morning and the middle of the afternoon, at least two hours after meals. Three readings were made at each sitting and the average recorded as the pressure at that time. Patients were always in the prone or semiprone position. Observations were always made on the same arm in each individual. The patient was quiet for at least one-half hour before the observation.

The urinary output for each day was likewise recorded. Any change therein which was accompanied or immediately preceded by an equal change in liquid intake was discarded from the records. The variations in the amount of fluid taken in twenty-four hours by any patient were slight, the individuals usually taking their entire allowance.

The pulse rate was recorded four times daily, and all observations which showed a change in rate of over eight beats per minute were

[20] Deutsch. Arch. f. klin. Med., 1908, xciv, 441.

excluded from the tables. Changes in pulse rate can therefore be fairly excluded from the causes of fluctuation in urinary output.

All observations made during a period in which the patient's temperature was more than one degree above the normal were also discarded from the final results. As it has been shown an increase of temperature causes an increased rapidity of circulation. (Hewlett[21]).

Six hundred and twenty-seven observations upon changes in blood pressure and coincident changes in urinary output were recorded. Four hundred and twenty-two of these contained one or more of the sources of possible error mentioned above. These were excluded from the results, which are based upon 205 observations.

The 205 observations are divided into six groups. Group I contains all the observations showing a rise in systolic pressure; Group II all those showing a fall. In Groups III and IV are placed similar changes in diastolic pressure. Groups V and VI contain those observations showing respectively increased and decreased pulse pressures. Each change in pressure is accompanied by the coincident change in urinary output.

From the results thus obtained there appears no definite relation between changes in systolic or diastolic pressure *per se* and changes in urinary excretion. There was a slightly larger number of instances in which a fall in pressure was accompanied by increased urinary output, but the difference was never greater than 20 per cent.

When, however, the cases of increased pulse pressure are analyzed, interesting results appear. It was found that whenever increased pulse pressure occurred in connection with a fall in systolic pressure the urinary output was increased. When, however, increased pulse pressure was due to a systolic rise, increase in urinary output occurred only in half the cases. Thus it appears that increased pulse pressure if due to a systolic rise may or may not be accompanied by a diuresis, but is always so accompanied if it be due to a systolic and diastolic fall. In other words, an increase in the caliber of the vascular system seems to be more efficient in promoting diuresis than does increased pressure in the aorta and its great branches.

The chief objection to the evidence cited above is that it lacks precision. It was, of course, impossible to estimate the pressure continuously during the twenty-four hours. For this reason there is a potential source of error in accepting the daily average pressure as that at which the entire twenty-four hour amount of urine was excreted.

It seemed advisable, therefore, to control the observations cited above by a series extending over a shorter time, during which a

[21] Jour. Med. Research, 1906, xv, 383.

more accurate estimate of conditions would be possible. For this purpose the method of studying the functional activity of the kidneys devised by Rowntree and Gerraghty[22] was employed. The test was performed in each case by Dr. E. L. Young, Jr. Dr. Young, whom I wish to thank for his help, also estimated the amount of phenosulphonephthalein excreted and measured the amounts of urine obtained. Thus the tests were carried out by one experienced in the technique, and the personal element was eliminated from the results, since neither observer knew the results of the other's work until the test was finished. By the test, the amount of urine and of test dyestuff excreted during one hour was determined. During this time systolic and diastolic pressure and pulse rate were determined at five-minute intervals. Two tests were performed on each patient: one while the daily pressure was at its constant high level, and one while it was lowered by administration of nitrites.

Eighteen patients were so tested. The results of the tests are placed in three groups as follows:

Group I, 3 cases, which showed a lessened urinary output when the blood pressure was lowered by nitrites. The patients upon whom these observations were made were in the last stages of cardiorenal disease, and their urinary excretion was not increased by any of the numerous methods used.

Group II, 12 cases, which showed an increased elimination of urine, phenosulphonephthalein, and urinary solids (as estimated by the specific gravity) during the period in which the systolic pressure was lowered by the administration of nitrites. The total nitrogen excretion was estimated by the Kjehldal method in 6 of these cases. In all there was increased nitrogen elimination during the period of lowered pressure.

Group III, 3 cases which gave results similar to those in Group II. The changes observed were, however, so small that they might have been due to technical errors. These cases are therefore not considered in the results.

In the 12 cases of increased elimination there was considerable variation in the diuresis obtained, the most marked change occurred in an arteriosclerotic patient whose average daily systolic pressure was 230 mm. of mercury. At that pressure he excreted in one hour 90 c.c. of urine containing 11.8 per cent. of phenosulphonephthalein. With an average systolic pressure of 190 mm. (the fall being due to sodium nitrite) he excreted 485 c.c. of urine and 50 per cent. of phenosulphonephthalein.

Continuous administration of a vasodilator in the cases cited above showed that a tolerance was soon developed by the patient. In from thirty-six to forty-eight hours the pressure returned to its

[22] Jour. Pharm. and Exp. Therap., 1910, 580.

original level, and as it rose the amount of urine fell, each reaching its original figure at about the same time. A further administration of the nitrites caused no change in pressure and no diuresis. In cases in which the nitrites caused no fall in blood pressure there was no diuresis. In 3 cases in which venesection was performed the fall in pressure and increase in pulse pressure was immediately followed by a rise in urinary output. It seems fair to assume, therefore, that the urinary increase noted in connection with a fall in systolic pressure was due to that fall, since the latter was the only variable factor detected.

These results differ slightly from those obtained by observation of the changes already discussed. In the former the changes in pressure were not the direct result of any change in treatment, and diuresis was due apparently to the increased amplitude of pulse pressure *per se*. In the cases treated with nitrites, however, the pulse pressure was diminished slightly. This diminution was, however, probably compensated by the increased output of the heart which occurs, according to Cameron,[23] Hewlett,[24] and Hirschfelder[25] when nitrites are administered.

The final deductions to be made from these observations may be set down as follows:

1. No definite relation could be established between changes in systolic or diastolic pressure *per se* and variations in urinary output.

2. There appeared to be a definite relation between changes in pulse pressure and urinary output, for whenever the former increased in the presence of a falling systolic pressure there occurred a diuresis.

3. The administration of a nitrite which has been shown to increase the volume output of the heart caused a diuresis even though pulse pressure was somewhat diminished by the systolic fall. In all instances in which a rise in urinary output was noted there was one characteristic change in the pressures noted. That change was an approach to what Gibson[26] calls the normal circulatory coefficient. Under normal conditions the ratio of diastolic pressure to systolic is 2 to 3; the ratio of pulse pressure to systolic pressure, 1 to 3. Under conditions of hypertension this ratio is destroyed. Whenever in the observations here cited the several pressures approached their normal ratios there was a rise in urinary excretion.

These facts are not in accord with the generally accepted theory of the relation of blood pressure to urinary secretion. As quoted by Osler,[27] that theory states that "the activity of the circulation through the kidneys at any moment—in other words the state of

[23] Interstate Med. Jour., 1911, xviii, 595.
[24] Loc. cit.
[25] Interstate Med. Jour., 1911, xviii, 556.
[26] Loc. cit.
[27] Practice of Medicine, 697.

the small arteries as regrads the contraction or dilatation depends not upon the need of those organs for blood, but solely upon the amount of material for urinary secretion that the circulating fluid happens to contain. When parts of the kidney have undergone atrophy the blood flow through the part that remains must, *cæteris paribus*, be as great as to the whole of the organ if they had been intact. But in order that such a quantity of blood should pass through the restricted capillary area, now open to it, an excessive pressure must obviously be necessary."

Thus the theory, yet the evidence cited has shown: (1) That excessive pressure not only does not cause increased flow through the kidneys, but may in extreme cases diminish it. (2) That destruction of large amounts of kidney substance or obliteration of the capillary circulation of those organs does not bring about an increase in blood pressure. (3) That a diminution of the hypertension of renal disease may cause increased function of the kidney.

There can be no conciliation between the theory as stated and the facts as experiment and observation bring them to light. From the former it appears that renal function is dependent upon pressure at which the blood passes through the kidneys. From the latter it appears that renal function is dependent upon the amount of blood passing through the kidney in a unit of time and that the pressure is unimportant. It is therefore necessary either to controvert the results here cited or to propound another theory which shall be in accord with the facts as they now stand.

Such a theory has recently been evolved by Fischer.[28] Briefly stated it is as follows: The retention of fluid by living cells is dependent not upon mechanical conditions, but upon the affinity of those cells for fluid. This affinity is increased when the colloids of the cells become more acid than normal. The colloids of the cells become abnormally acid under any conditions that interfere with the proper oxygenation of the tissues. Such a condition is found in nephritis.

The facts here cited may be easily explained on the basis of Fischer's theory, for according to it the rate of circulation would be the controlling factor in determining urinary output, and not the pressure under which the blood flowed. Thus an increase or decrease in systolic or diastolic pressure might or might not be associated with an increased oxygenation of the kidney. If it were urinary output would increase, if not, it would remain stationary or fall. This is exactly what does take place according to the evidence here cited. The explanation of the diuresis associated with increased pulse pressure is simple upon the basis of Fischer's theory, for if the pulse pressure be increased the efficiency of the circulation is enhanced, and an increased supply of oxygen is

[28] Fischer, Nephritis, 1912.

therefore carried to every organ. Its acidity is therefore diminished, its affinity for fluid grows less, and diuresis results. In a similar way the diuresis obtained with a vasodilator may be explained, though in that case the increased oxygen supply is due in part to the action of the drug directly upon the heart.

Here then is a theory which appears to have no quarrel with the facts. It is based upon evidence obtained from animal experimentation and from the use of artificial circulation schemes, and has been confirmed in a few instances by observations on man. Observations upon human beings intended to establish the application of Fischer's theory to conditions as they are found in chronic nephritis offer an interesting field for clinical research, and evidence thus obtained will be necessary to make clear the relation of circulatory conditions to urinary excretion.

I wish to express my thanks to Dr. F. C. Shattuck for making this work possible and for encouragement at all times. My grateful acknowledgement is also due to all the members of the hospital staff who rendered me aid whenever called upon.

TABLE I.—Changes in Systolic Pressure.

	Number.	Per cent.
Changes in systolic pressure recorded	105	
Increased pressure recorded	48	45.7
Increased pressure associated with rise in urinary output	20	41.6
Increased pressure associated with fall in urinary output	28	58.4
Decreased pressures recorded	57	54.3
Decreased pressure associated with rise in urinary output	33	57.9
Decreased pressure associated with fall in urinary output	24	42.11

TABLE II.—Changes in Diastolic Pressure.

	Number.	Per cent.
Changes in diastolic pressure recorded	100	
Increased pressures recorded	52	52.0
Increased pressure associated with rise in urinary output	19	36.5
Increased pressure associated with fall in urinary output	33	63.5
Decreased pressures recorded	48	48.0
Decreased pressure associated with rise in urinary output	31	64.5
Decreased pressure assocaited with fall in urinary output	17	35.5

TABLE III.—Changes in Pulse Pressure.

	Number.	Per cent.
Changes in pulse pressure recorded	109	
Increased pulse pressure recorded	56	51.3
Increased pulse pressure associated with rise in urinary output	32	57.1
Increased pulse pressure associated with fall in urinary output	24	42.9
Decreased pulse pressure recorded	53	48.7
Decreased pulse pressure associated with rise in urinary output	23	43.3
Decreased pulse pressure associated with fall in urinary output	30	56.7
Increased pulse pressure associated with fall in systolic pressure	32	
Instances associated with rise in urinary output	32	100.0
Instances associated with fall in urinary output	0	0

THE BRAIN LESIONS PRODUCED BY ELECTRICITY AS OBSERVED AFTER LEGAL ELECTROCUTION.

By Edward Anthony Spitzka, M.D.,

DIRECTOR AND PROFESSOR OF GENERAL ANATOMY, THE DANIEL BAUGH INSTITUTE OF ANATOMY OF THE JEFFERSON MEDICAL COLLEGE,

AND

Henry E. Radasch, M.D.,

ASSISTANT PROFESSOR OF HISTOLOGY AND EMBRYOLOGY, JEFFERSON MEDICAL COLLEGE, PHILADELPHIA.

(From the Laboratories of the Daniel Baugh Institute of Anatomy.)

The rapid growth in the employment of electricity in the industries and in general traffic and the concomitant increase in the annual lists of accidental injuries and deaths from industrial currents render it of interest to note what effects result in various parts of the human organism. The observations of one of the writers have been assembled in several papers and published during the last decade[1] and while mention is made of a peculiar type of brain lesions which has apparently not been observed as a resultant of any other mode of death, the present contribution is to give more explicit details, the result of investigations upon the brains of 5 criminals executed by electricity. We are particularly prompted to submit our observations because of the constancy of the appearance of those lesions.

The nature of the current employed in electrocutions is described in the papers cited.

Technique. The axial portion (pons-oblongata and midbrain) of 5 brains was subjected to careful histological examination after fixation in formalin, the immersion of the brain into the preservative usually occuring within fifteen minutes after death. Each brain stem was subsequently divided transversely into six to eight segments, dehydrated, cleared, and infiltrated with celloidin. Sections were then cut at 15 to 20μ and stained, some with hematoxylin and eosin, some with Van Gieson's stain, and some with Weigert's myelin stain.

A general examination of the slides thus prepared revealed at all levels peculiar areas, varying in size and number. These areas, unlike anything ever seen before by the authors, are circular in outline, ranging in diameter from 25 to 300 μ. The most marked areas measure from 150 to 200μ. They are seen to consist of two portions, a central rarified part and a peripheral condensed zone.

[1] Amer. Jour. Insanity, 1902; New York Daily Med. Jour., February 1, 1904; Med. Critic, August, 1903; Proc. Amer. Philos. Soc., xlvii (read April 23, 1908); Jour. Med. Soc., New Jersey, 1909; Philadelphia Electric Current News, April, 1911.

The most characteristic areas contain a bloodvessel (capillary or precapillary), surrounded by a delicate small-meshed reticulum representing the central four-fifths of the area. The fibrils of the reticulum are, in the main, radially directed, and nuclei are sometimes observed along this course. The peripheral zone surrounding the central portion in a ring-like manner appears to be condensed, staining more deeply than the surrounding unaffected tissue, and is sometimes seen to be composed of circularly arranged strata, which are usually free from nuclei.

The detailed study of each specimen resulted as follows:

CASE I.—J. B., executed at ——— prison, July 17, 1905. Two contacts, 1.07" and 0.05"; max., 1780 volts, 8 ampères.

SPINAL CORD, UPPER CERVICAL REGION. Here these areas are fairly large and numerous, but mainly unilateral. They are chiefly grouped in the ventral horn, and are scattered from there to the midperipheral area of the white substance.

AT HIGHER LEVELS. At higher levels the areas increase in number becoming quite plentiful in the interolivary white substance, among the central longitudinal fiber tracts, and in the formatio reticularis generally. The olivary gray and the various nuclei have not escaped; in fact, the lesions seem to have become grouped in and about the olivary body, while the peripheral fiber tracts have been largely spared.

PRE-OBLONGATA (PARS DORSALIS PONTIS). The ventral two-thirds of the area of the section (that is, just dorsad of the pons proper) is seen to be fairly riddled with lesions, while the dorsal one-third just ventrad of the ventricular floor contains but few areas. Where they exist they are more scattered than in the lower levels; as a rule, the areas are small, but well defined and characteristic. The largest are nearest to the mesal line.

At the level of the inferior quadrigemina the lesions are less numerous, but are of larger size, and are situated mainly in the longitudinal fiber tracts. Higher up at the level of the pregemina the sections are seen to be riddled in all parts of the field.

CASE II.—M. E., executed at ——— prison, April 10, 1905. Two contacts, 1.06" and 0.03"; 1750 volts, 9 ampères.

CERVICAL CORD. Many small areas are seen in the white substance, giving the section a cribriform appearance. The gray substance contained only a few lesions, 15 to 30μ in diameter, but of a characteristic appearance.

POSTOBLONGATA. At the level of the pyramidal decussation the lesions are very numerous and a little larger than in the cervical cord. They are scattered diffusely in both gray and white substances, and are 25 to 40μ in diameter. At this level the capillaries seem more involved, since the nuclei along the inner circumference of the outer zone seem to be those of the capillary endothelium.

At the level of the olive the areas are more numerous, larger

FIG. 1.—Section of middle of pons of J. B.

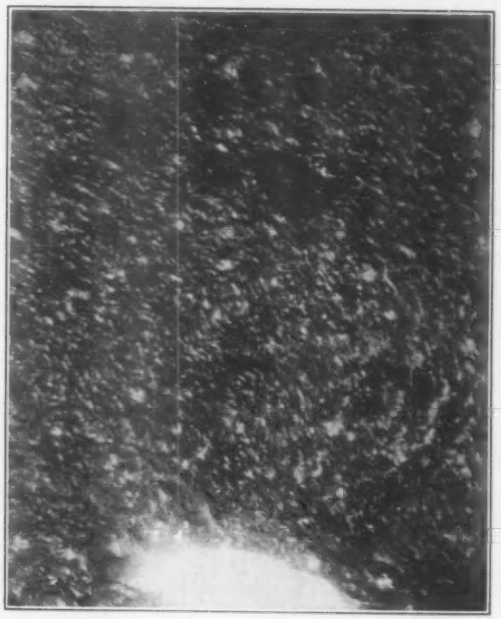

FIG. 2.—Section of brain stem of M. E., at level of inferior cerebellar peduncle. × 80.

and more localized near the mesal plane (raphé), and involving mainly the longitudinal fiber tracts.

PREOBLONGATA. The lesions here are less numerous again, and are situated mainly in the dorsal part of the sections.

MIDBRAIN. In the midbrain sections the largest areas are near the mesal line and just ventrad of the central aqueduct gray. The smaller areas occupy the remainder of the sections. The longitudinal fiber tracts present a ragged appearance, as though they had been badly torn by some diffusely explosive or disruptive force. Occasionally there are seen ruptured myelin sheaths, which respond to Weigert's stain.

CASE III.—G. G., executed at ——— prison, February 25, 1907. Three contacts, 1.04", 0.10", 0.07"; 1820 volts, 9½ ampères.

POSTOBLONGATA. In the region of the pyramidal decussation the lesions are, preponderatingly, unilaterally situated. They are located mainly in the gray substance, though a few are noted in the dorsal tracts. The myelin seems altered in some inexplicable way, for it does not respond well to the stain. Longitudinal sections of bloodvessels reveal the arrangement of these lesions as being perivascular, spherical expansions like beads along and about the vessel wall. (A structural peculiarity noted in this region was a duplication of the central canal.)

PREOBLONGATA. The areas here are small, but numerous mainly in the longitudinal fiber tracts, which exhibit a ragged appearance, while the transverse fiber tracts seem to be unaffected.

MIDBRAIN. At the level of the postgemina the ragged appearance of the longitudinal tracts is very marked as is also the distention of the vessels. At a higher level the lesions are less numerous and the ragged appearance of the white substance is less marked.

CASE IV.—A. S., executed at ——— prison, March 9, 1908. Four contacts, 1.02", 0.05", 0.10", 0.05"; 1880 volts, 9 to 11 ampères.

Sections of the brain stem at various levels reveal the characteristic lesion, areas much the same as described in Case I. They are everywhere quite numerous, the more so and largest in the preoblongata.

CERVICAL CORD. Here the lesions are few in number, but distinctly marked.

CASE V.—G. W., executed at ——— prison, March 3, 1908. Two contacts, 1.10", 0.06"; 1850 volts, 8 to 11 ampères.

Sections of this brain stem reveal the largest and most characteristic lesions and serve as the best examples for general study and illustration.

SPINAL CORD, CERVICAL PORTION. Sections of the upper part of the spinal cord show large areas situated chiefly in the white substance, and most numerous in the dorsal columns close to the gray substance. At the pyramidal decussation they are less numerous and smaller, and at higher levels diminish in number, with,

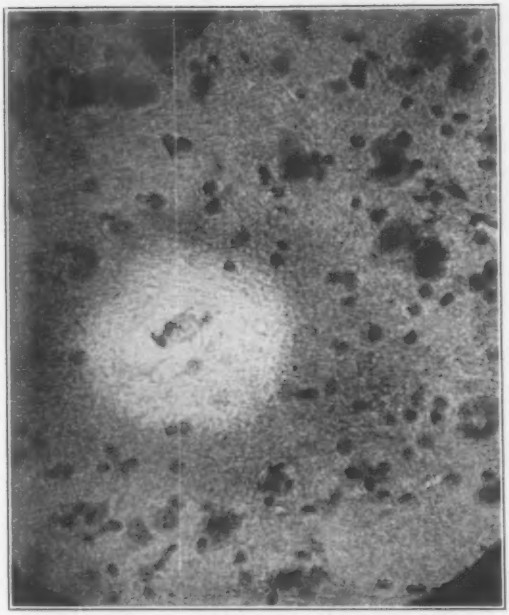

FIG. 3.—Section of pars dorsalis pontis of G. W. × 420.

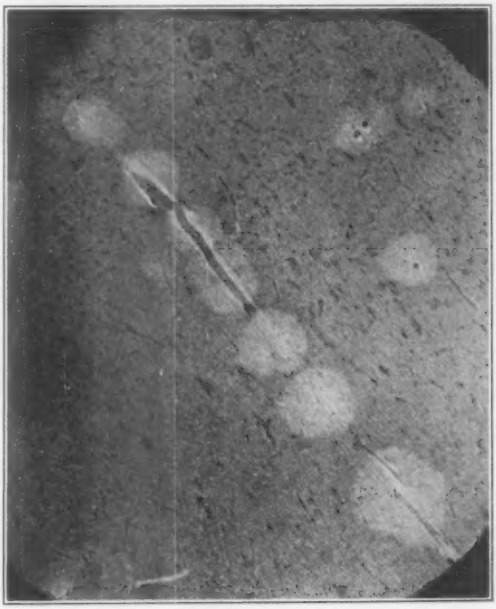

FIG. 4.—Section of brain stem of G. W., at junction of pons and oblongata. × 110.

however, an increased proportion of areas containing bloodvessels. At the level of the caudal end of the olive these lesions are numerous and large, averaging 150 to 250μ in diameter, while the white substance presents a ragged appearance. In the midolivary sections the lesions are still numerous and fairly large. Many vessels apparently show the effect of a sudden dilatation with subsequent contraction, particularly in the longitudinal tracts. Other areas are seen to be serially connected like a string of beads and strung on a longitudinally sectioned bloodvessel.

FIG. 5.—Section of oblongata, midolivary level, of G. W. × 110.

At the ponsoblongata transition the vessels are sausage-like and the areas quite numerous. At the level of the inferior quadrigemina the lesions are seen to be arranged in groups as well as single rows, and are large and numerous. One area of special interest is noted in this level; its central part is quite ragged, and contains vessels and torn tissue as though a sudden explosive rending of the structures had occurred. The lesions are equally large and numerous in sections at the level of the superior quadrigemina.

The number and size of the lesions with the number of shocks administered and the length of contacts, are comparatively shown by the following table:

	Shocks.	Total duration.	
Case I. J. B.	2	1.12	lesions not of the best.
Case II. M. E.	2	1.09	lesions, average number and size.
Case III. G. G.	3	1.21	lesions most numerous but not so large as in Case V.
Case IV. A. S.	4	1.22	fewest and smallest lesions.
Case V. G. W.	2	1.16	best examples of lesions.

One can only guess at the mode of formation of these lesions. It seems inconceivable that they could be due to sudden momentary dilatations of the bloodvessels themselves. The bead-like arrangement of the lesions along the bloodvessels, the condensation zone limiting each lesion, and the radially disposed fibers and torn tissue would seem to indicate a sudden liberation of the bubbles of gas due to the electrolytic properties of the current as it seeks the paths of the least resistance along the vessels. The maximum number of lesions are found in the most constricted parts of the brain stem in the path of the current, and are most numerous along the longitudinal fiber tracts and bloodvessels.

Since we made mention of our observations in April, 1908, we have noted similar lesions produced in the course of experiments conducted by Sir Victor Horsley and R. H. Clarke.[2]

HOSPITALS AND TYPHOID CARRIERS.[1]

By John W. Brannan, M.D.,
NEW YORK.

During the last two years an increasing amount of attention has been called to the danger to the public health of typhoid carriers, and to the importance of their recognition and control. In August of last year, Meakins,[2] of Montreal, in an exhaustive article on the subject, urged that in our general hospitals, where at least 50 per cent. of the cases of typhoid fever are treated, every case of the disease should be examined bacteriologically during convalescence, and should be kept in the hospital or under strict observation and be treated by homologous vaccines until the excreta were free of typhoid bacilli. Meakins further advised that patients under the care of physicians in private practice should be watched and examined from time to time by officials of the board of health. Impressed by the suggestion of the Canadian

[2] Brain, Part CXXXI, vol. xxxi.
[1] Read at the annual meeting of the Association of the American Physicians, May 15, 1912.
[2] Canadian Med. Assoc. Journal, 1911, p. 711.

writer, I requested Dr. Norris, the director of laboratories in Bellevue and its allied hospitals, to have the feces and urine of all cases of typhoid fever examined during convalescence. This work was begun in September, 1911, and has continued up to the present time. One hundred and nineteen cases in all have been examined, and of these, 15, or 12.6 per cent., had typhoid bacilli in either the feces or the urine or in both. An average of two examinations was made in each case. Forty-eight cases were also examined during the active stage, with a positive result in 10, or in 20.83 per cent. From these figures it appears that about 1 case in 5 gave positive findings during the active stage of the disease, but only 1 in 8 cases by the time they had arrived at convalescence. All patients with the exception of two were bacteriologically free before they left the hospital. These two patients were discharged inadvertently. Their names and addresses and occupations were sent to the Board of Health, though not as promptly as might be wished, as the mistake was not discovered for some time. Our own social service department is also endeavoring to trace them in order that we may make further examinations, if possible, and determine if they are still carriers. At present no typhoid patient is discharged from any of the hospitals in the department except with the approval of the general medical superintendent. We have found no great difficulty in holding patients until they are presumably bacteria free, at least two successive negative examinations being required in every case.

It may be urged that patients discharged as bacteria free after only two examinations with negative results are still potential carriers and would prove to be actually such on further examination. It is believed, however, that this measure of precaution will serve to arrest the great majority. As the work progresses and our methods improve with experience, we shall no doubt be able to increase the number of examinations, at least in those cases that have given positive results at some time in the course of the disease. Dr. Norris is trying to devise some method of securing the bile, which may enable us to arrive at more exact conclusions. Dr. William Hallock Park has also some such procedure in view.

There is one measure at least that we can take to guard the public health against infection by typhoid carriers, either actual or potential, and that is to instruct them in the simple rules of cleanliness. This we should do with all cases of typhoid fever when they leave the hospital or pass from our observation in private practice, but particularly should we do this in the case of those who have shown themselves to be at least transitory carriers. These who are engaged in the preparation or distribution of food should be doubly warned in this regard. We are now preparing a leaflet of instructions to be given to each patient on discharge from the hospital. It would be well, of course, to prevent such

persons from following occupations involving the handling of food or drink; but this in many instances would probably be impossible, particularly in this country. At all events, this is the province of the Board of Health, not of the hospital. It is for us to instruct the patient and give notice to the health authorities, that they may take the necessary measures to protect the public. It may be of interest to note the proportion of those engaged in occupations in which they were liable to infect others. In the 140 different individuals who form the subject of this study there were 14 housewives, 3 nurses, 3 waiters, 2 cooks, 1 orderly, 1 butler, and 1 baker—25 in all. One has but to read this list to see how impossible it would be to compel any considerable number to change their occupation. Hence the importance of instructing them both orally and in writing how to avoid conveying infection.

Regulations for the control of typhoid carriers have been enforced in some countries of Europe for a number of years. In the southwestern provinces of Germany there is probably no case of typhoid fever released from observation until the bacteriological examination of the feces and urine has proved negative. In England also typhoid carriers receive a great deal of attention, especially in the English army. After treatment for a period of three months, if it is found that the soldiers are still carriers, they are given the opportunity of entering the hospital or of being discharged. In case of discharge, notification is sent to the medical officer of health of the district in which the soldier is going to reside. In the service in India two convalescent depots were established several years ago, to which the convalescents of certain military stations are sent. After the opening of these depots, namely, Wellington and Naini Tal, it was found that the admissions of typhoid fever from all stations which sent their convalescents there show a reduction of 9 per cent., in 1908, from the figures for the previous year, whereas the remaining stations show an increase of 26.6 per cent.

In the endeavor to sterilize typhoid carriers various methods of treatment have been tried, such as the use of lactic acid bacilli, acidifying the urine, the administration of antiseptics, the use of the *x*-rays, and the employment of vaccine. The surgeons[3] of the English army report the following results from the use of these five different means of treatment: (1) Lactic acid bacilli cause only a temporary disappearance of the typhoid bacilli. (2) Acidifying the urine fails to cure typhoid bacilluria. (3) The administration of antiseptics invariably brings about a decided diminution in the number of bacilli both in fecal and in urinary carriers. This effect is much more marked when the maximum contact of the antiseptics with the bacilli is obtained by combining the treatment with low diet and aperients in the case of "fecal," and with

[3] Cummins, Jour. Royal Army Med. Corps, London, 1910, xiv, 268-384.

diuretics in the case of "urinary" carriers. (4) The use of *x*-rays in the case of gall-bladder infection seems to have definite beneficial results. (5) Vaccines, like the lactic acid bacilli, cause only temporary disappearance of typhoid bacilli. It is suggested that the treatment by vaccines might have a better chance of success if combined with diuretics in the case of "urinary" carriers, and with *x*-ray treatment in gall-bladder cases. Sir Almroth Wright has pointed out that a vaccine is more likely to be efficient when the local conditions are so altered as to permit the fullest possible contact between the bacteriolytic products in the blood and the bacteria involved.

Other observers have had better results with vaccines than the English army surgeons. Some have reported permanent cures in cases of long standing, notably Meakins[4] in 2 cases described in detail, 1 of chronic bacilluria of twelve years' duration, the other one of chronic suppurative cholecystitis with gallstones of eight years' duration. At Bellevue we have as yet had to do only with transitory carriers, but Dr. Norris is prepared to use autogenous vaccination when occasion arises.

In conclusion, I am glad to add that these investigations have not proved burdensome to our pathological department, nor have they interfered with the regular routine of the laboratory. The clinical side of the problem presents somewhat greater difficulties, as we have to deal with the changing house staffs of four different hospitals, and it is not always easy to secure their effective coöperation. Gradually, however, even these difficulties are being overcome, and we may reasonably expect that with patience and persistence and good will on all sides they will give us less and less trouble in the future.

THE THERAPEUTIC USE OF VACCINES IN TYPHOID FEVER.[1]

By James G. Callison, M.D.,

PATHOLOGIST, MANHATTAN EYE, EAR, AND THROAT HOSPITAL, NEW YORK.

Vaccines have an unquestioned value in the prevention of typhoid fever. This is evidenced by the experience of various military organizations, and especially the maneuver division[2] of the United States Army in camp in Texas and along the Mexican

[4] Canadian Med. Assoc. Jour., 1911, p. 496.

[1] Read before the New York Academy of Medicine, Section on Pediatrics, being the joint meeting with the Philadelphia Pediatric Society and the New England Pediatric Society.

[2] J. R. Keen, Jour. Amer. Med. Assoc., 1911, lvii, 713 and 714.

border during the summer of 1911. The advisability of their therapeutic employment is as yet, however, an open question. That they have a value is borne out by the testimony of nearly everyone who has reported a series of cases of typhoid fever treated with vaccines as well as by my personal experience. Possibly lack of experience is the most usual cause of failure to resort to their use. I have also heard doubts expressed by some physicians who had treated cases of typhoid fever with vaccines, but who expected them to act as an antitoxin. That the action is different from this is an important point to remember. Vaccines give rise to a slowly initiated, gradual production of antibodies.

In using typhoid vaccines therapeutically, success or failure must be judged in the light of the reaction of living tissue to injections of dead typhoid bacilli. This reaction (the production of opsonins and agglutinins in healthy individuals) has been carefully worked out by Russell and others. According to Russell the response is quite constant, and follows the same curve as is observed after the introduction of any antigen. He has shown that for a period varying between five and eleven days (average eight days) there is no production of opsonins and agglutinins; that from that time until about the twenty-fifth day there is a very rapid production of antibodies, so that these are present in great concentration. This is the result in a normal individual. In the therapeutic use of vaccines, if there is to be any beneficial effect on the temperature curve, it must follow closely the same physiological reaction; for the physiology of the individual or of his component cells is not qualitatively altered. In other words, theoretically, an interval of from five to eleven days should intervene between the first inoculation and any production of antibodies in response to that injection. Following this, there should be a more rapid drop in the temperature curve when the protective substances produced by the inoculation are added to those produced by the infection present. There will, however, be this difference: The reaction of immunity has already been initiated by the existing infection, and the reaction in response to the vaccination will come more quickly than in a normal individual, and the interval between the inoculation and its response will be shortened. This point is shown in the accompanying charts.

In all, I have treated 38 cases of typhoid with vaccines, 24 of which I have previously reported. In these 38 cases there have been 5 deaths and 1 relapse, with an unusual absence of complications. The causes of death were a femoral phlebitis and its sequelæ, a double lobar pneumonia, a meningococcus septicemia, a ruptured spleen, and asthenia. Ultimate conclusions, however, should be drawn from a large number of cases rather than from an individual series.

As illustrative of the changes in the temperature curve in vaccine-treated patients six charts are shown. These changes are to be

interpreted in the light of what is known of the production of antibodies following inoculations of vaccines. As these are typhoid cases of typical onset, history, and diagnosis, I wish to call special attention to the changes in the temperature at a time corresponding to the increased production of antibodies following the vaccine inoculation.

CASE III.—Miss T. K., aged fourteen years. She was admitted on the fourteenth day of the disease with the Widal positive, and the vaccine treatment was instituted at once. On the twentieth day there was a marked change in the temperature curve, which reached normal two days later.

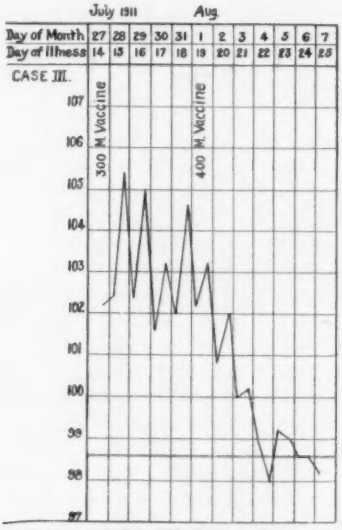

CHART I.—Temperature curve of Case III showing change in temperature due to vaccine treatment.

CASE IV.—Mr. F. B., aged sixteen years. The patient was taken ill on Friday with pains in his legs and headache. He was first seen on Sunday, with a temperature of 105° F., which responded to purgatives, but immediately rose again. He was admitted to the hospital on Friday following his initial symptom, the board of health having reported a positive Widal on Thursday. The total duration of the disease was fourteen days, seven days after the initial inoculation.

CASE V.—Mr. H. L., aged twenty years, admitted on the fourteenth day of the disease. The vaccine treatment was instituted on the nineteenth day. The temperature showed an abrupt change on the twenty-fourth day, coming to normal on the twenty-ninth

day, ten days after the initial inoculation. The Widal reaction, which did not become positive until the nineteenth day of the disease, was positive at a dilution of 1 to 3200 eleven days after the first vaccine injection.

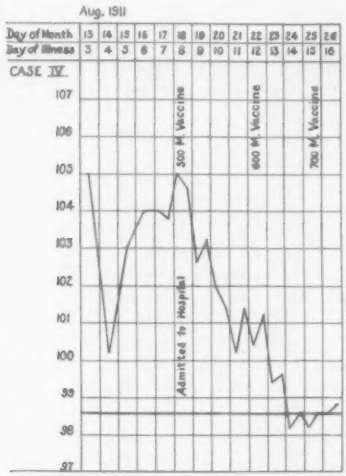

CHART II.—Temperature curve of Case IV after vaccine treatment.

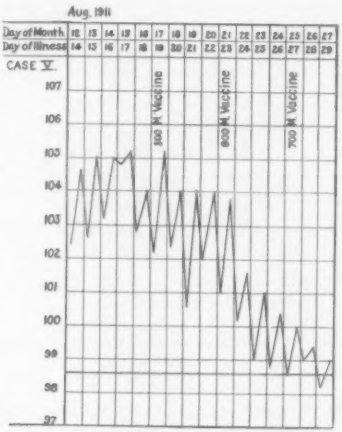

CHART III.—Effect of vaccines on temperature of Case V.

CASE VII.—Mr. J. R., aged sixteen years. An apparently average case of mild typhoid, with no well-marked benefit from the vaccines. The attack ran a text-book course. The chart is self-explanatory.

CASE IX.—Miss M. R., aged seventeen years. This patient was admitted to the hospital with a tentative diagnosis of typhoid fever, on the fourth day of illness, but did not give a positive Widal until the eighth day. Vaccine treatment was then instituted. On the twelfth day the type of temperature curve changed, the morn-

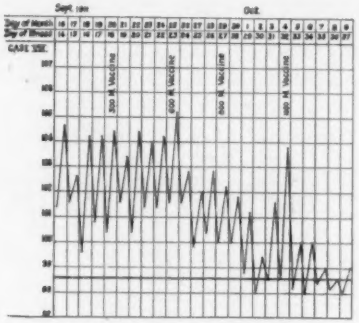

CHART IV.—Temperature curve of Case VII.

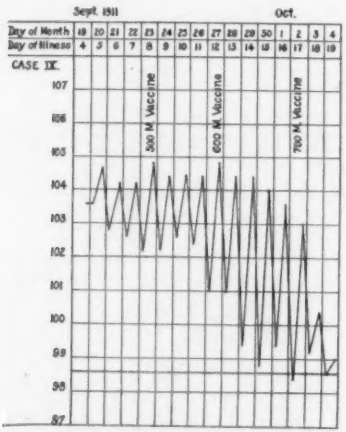

CHART V.—Temperature curve of Case IX showing change in character of fever on twelfth day.

ing remissions being more marked. This became more and more exaggerated until on the eighteenth day the evening temperature was little above normal per rectum, and after that it remained normal. The evening rise in this case was so marked as to require cold sponging up to the sixteenth day, two days before a normal curve was reached.

CASE X.—Master A. R., aged two and a half years, weight 25 pounds. The patient was admitted on the fifth day of the disease, and the first inoculation was on the seventh day. The temperature became normal on the fifteenth day, eight days after the first inoculation. Simultaneously both tympanic membranes ruptured and discharged.

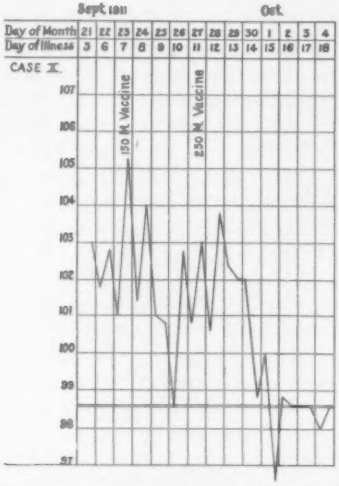

CHART VI.—Temperature curve of Case X, which reached normal on the fifteenth day, eight days after first inoculation.

These charts show a marked change in the temperature curve at a time corresponding to the beginning rapid production of opsonins and agglutinins in the healthy individual following prophylactic inoculation. This change in the temperature occurs so frequently in typhoid cases treated with vaccines that it seems to be more than a coincidence and suggests that the vaccine has played a part in shortening the course of the disease. Accompanying this change in the temperature curve and slightly antedating it, there is an even more marked change in the clinical appearance of the patients. They lose the "typhoid facies," appear bright, and take an interest in what is going on about them. The appetite returns sooner than in patients on ordinary or routine treatment, and they sleep better. There is also a less number of relapses in patients receiving vaccine treatment, and complications seem to be lessened in a way not always easy of explanation.

In the illustrative charts shown there is a similar response to the vaccines in all cases, early and late, with the difference, if there is any, in favor of the early cases. This fact emphasizes the importance of making every effort to secure the earliest possible deter-

mination of the infection, so that treatment may be instituted early. Of the various diagnostic procedures now in use and available for the clinician, blood cultures give the earliest positive information and this should be resorted to whenever possible.

The contraindications to the use of vaccines in typhoid fever have not so far been worked out. Certainly, severe clinical manifestations do not forbid the use of this form of therapy. In some of my cases the prognosis has been of the gravest form, yet the patients responded in a most satisfactory manner. For instance, one patient was suffering from a severe intercurrent nephritis, face edematous, expression dull, urinary findings bad; yet she improved rapidly under vaccines in large doses. Another patient, a bartender, was wildly delirious and constant restraint was necessary. The temperature was running between 104° and 105° F. He was given a dose of 500,000,000 typhoid vaccine, and on the fifth day thereafter the temperature fell to 102.4° F., and he was rational, quiet, and appeared bright. A few hours later he died from internal hemorrhage from a ruptured spleen, which at autopsy weighed 1030 grams. A third patient was in dull delirium, passing urine and feces involuntarily, temperature around 105° F., with a rise of as much as one degree following cold sponging. He made a highly satisfactory recovery after large doses of vaccine—2,000,000,000 in six days' time.

I have recently published[3] a full discussion of vaccines in typhoid fever, with a summary of reported cases, to which those who wish a full presentation are referred. At that time I was able to collect 323 cases of typhoid fever treated with vaccines, with 17 deaths, or 5.2 per cent.; and 20 relapses, or 6.2 per cent. Since that time Meakin and Foster,[4] of Montreal, have reported a series of 41 cases, with the following results in the vaccine cases, embracing one service in the hospital, as compared with the remainder of the hospital: Deaths, vaccine cases, 2.4 per cent.; routine, 10 per cent. Relapses, vaccine cases, 2.4 per cent.; routine, 13 per cent. Complications, vaccine cases, 5 per cent.; routine, 42 per cent. Duration of fever, vaccine cases, twenty-eight days; routine, 37; decrease, nine days. Seventeen cases were vaccinated during the first two weeks and of those only three required a second inoculation. The average duration of fever in the remaining 14 cases were seventeen days. In all, 26 cases received one dose, and the average duration of fever after this inoculation was five days. Eleven cases received two injections, and the average duration of fever after vaccine treatment was instituted, was twelve days. Only 4 of the 41 cases received more than two inoculations. These patients received the largest dosage so far reported. The initial dose was 1,000,000,000. Eight

[3] The Vaccine Treatment of Typhoid Fever, Med. Record, 1911, lxxix, 1129 to 1139, 1161. (This gives a complete bibliography up to that date.) Prophylactic Inoculation and Vaccine Treatment in Typhoid Fever, Post-Graduate, 1911, xxvi, 718 to 740.

[4] Treatment of Typhoid Fever, Canadian Med. Assoc. Jour. (Toronto, 1911), i, 496 to 502.

days later, if required, a second dose of 1,500,000,000 was given and if at the end of a second eight-day period the patient was still running a febrile course, a third injection of 2,000,000,000 was given. The results were certainly most satisfactory. In many of their cases the temperature terminated so rapidly as almost to be by crisis. As to the influence of vaccines on the toxemia, their testimony is equally positive and in accord with the opinion of others. They say: "The beneficial influence of the vaccines on the toxic symptoms was almost constant. In some cases the toxemia diminished out of proportion to the drop in temperature, but in the majority these two conditions were parallel. It may be stated at this time that in no case did any increase in the toxic symptoms appear after the administration of the vaccine."

Elliott[5] treated 3 cases of typhoid fever with vaccines. No facts are given, but he was so well pleased with the results that he expects in future to treat all cases seen early in this way.

Courmont[6] treated 39 cases of typhoid fever with vaccines, using daily two rectal injections of 100 c.c. of killed bouillon culture. There were 2 deaths in the treated cases, or 5 per cent., as against 20 deaths in 171 untreated cases, or 11.6 per cent. "Many cases were materially shortened, defervescence occurring prematurely and unexpectedly." Eight patients relapsed, but all were cured.

Sadler[7] used vaccines in 52 cases of enteric fever, giving an initial injection of 2,000,000 (*sic*) and a later one of 1,000,000 (*sic*). It seemed incredible that he should use so small a dosage after familiarizing himself with the declaration of Smallman[8] that 300,000,000 is the minimum efficient dose. There were 9 deaths in the 52 cases. He admits that the death rate was not reduced, but thinks the patients were otherwise much benefited. He complains that the appetite was stimulated before the condition of the patient justified him in increasing the diet.

Pollack[9] used an autogenous vaccine in a case of typhoid fever complicated by hemorrhages before vaccination was instituted. Improvement began on the eighth day after the first inoculation, but was slow. The case was later complicated by an attack of parotitis.

Renaud[10] treated a variety of conditions with typhoid vaccine. He used a bouillon culture killed by ultraviolet rays. Among his patients was one case of typhoid fever. The patient made a rapid recovery.

[5] Vaccine Therapy in Typhoid, Southern Med. Jour. (Nashville), v, 1–7, abst. Jour. Amer. Med. Assoc., 1911, lvii, 1861.

[6] Treatment of Typhoid Fever by Rectal Injections of Killed Cultures of Eberth's Bacillus. Paris Letter, Jour. Amer. Med. Assoc. (1912), lviii, 1868.

[7] Quarterly Jour. Med., 1911, v, 193–228.

[8] Jour. Royal Army Med. Corps, London, 1909, xii, 136.

[9] Ibid., 1911, xvi, 653.

[10] Presse Médicale, 1911, xix, 665–672.

O'Connor[11] treated a mild case of typhoid with vaccine. The patient made a speedy recovery.

Rosenberger[12] used an autogenous vaccine in a case of typhoid osteomyelitis that had persisted for one year. A cure was obtained in six weeks.

Sharpless[13] treated a case of typhoid periostitis that had persisted for six years. A cure was effected in about two weeks.

Leishman[14] used typhoid vaccine in an unspecified number of cases of typhoid fever. He began this work with a small dose, but cautiously increased this until the initial dose was 50,000,000. He says: "The number of cases so treated is too small to base any general conclusions on, but all who had to do with the patients thought they had benefited greatly. The enteric facies disappeared, the patients said they felt better, and in two or three cases they even asked that the vaccine should be repeated. . . . In my opinion the vaccine treatment of enteric fever is sound practice, and will grow in favor as time goes on."

In addition to the 24 cases already reported by me, I have treated 14 cases, with 2 deaths and no relapse. The deaths were the case of ruptured spleen referred to above, and a patient in whom death was due to asthenia. The dosage I have been using in this series of cases was an initial injection of 500,000,000, repeated at four-day intervals as long as required, and increasing the dose 100,000,000 at each subsequent injection. This gives a total dose similar to the total dosage of Meakin and Foster, as I give half their dose at half the interval. I believe this to be the better practice. I have continued using a stock vaccine, as it causes less local reaction and is less toxic than an autogenous vaccine. It is as efficient a producer of bactericidal substances (opsonins and bacteriolysins) as the more recently isolated strains, and has fewer undersirable side actions.

The vaccines are given in the same way as any hypodermic medication, and the injections are made just under the skin over the insertion of the deltoid or over the tensor vaginæ femoris. Any spot may be selected that is rich in connective tissue and not called into too active motion. The local reaction is essentially the same in prophylactic vaccination and therapeutic inoculation, and consists of redness, swelling, and a brawny induration and is painful on pressure. This passes away in about twenty-four hours and the tissues rapidly return to normal. I am accustomed to warn patients that the arm is going to be very sore, an indication that the medicine is beginning to take effect. In the therapeutic use of typhoid vaccine the systemic reaction can be ignored. In very few of the patients I have treated has there been a rise of temperature

[11] Kentucky Med. Jour., 1911, ix, 978–980. [12] New York Med. Jour., 1911, xciii, 927.
[13] Jour. Amer. Med. Assoc., 1912, lviii, 1114.
[14] Glasgow Med. Jour. (Glasgow, 1912), lxxvii, 401–410, abs. Jour. Amer. Med. Assoc., (1912), lix, 311.

frankly due to the vaccine, and in none has there been an aggravation of the clinical picture.

Case No.	Patient.	Sex.	Age.	Day of disease.	Date of inoculations.	Amount of vaccine given.	Febrile days after first inoculation.	
1	A. Q.	M.	28	8	June 8	500,000,000	5	Death from ruptured spleen. Post-Graduate Hospital. Service of Dr. Edward Quintard.
2	T. L.	M.	42	14	July 13	500,000,000	30	Uneventful course. Cure. Post-Graduate Hospital. Service of Dr. Edward Quintard.
					July 17	600,000,000		
					July 20	700,000,000		
					July 24	800,000,000		
					July 28	900,000,000		
					Aug. 1	1,000,000,000		
3	T. K.	F.	14	14	July 27	300,000,000	8	Uneventful course. Cure. Post-Graduate Hospital. Service of Dr. Edward Quintard.
					Aug. 2	400,000,000		
4	F. B.	M.	18	7	Aug. 18	500,000,000	6	Uneventful course. Cure. Post-Graduate Hospital. Private patient of Dr. John Welsmiller.
					Aug. 22	600,000,000		
					Aug. 25	700,000,000		
5	H. L.	M.	22	20	Aug. 17	500,000,000	9	Uneventful course. Cure. Post-Graduate Hospital. Service of Dr. Edward Quintard.
					Aug. 21	600,000,000		
					Aug. 25	700,000,000		
6	J. G.	M.	13	9	Sept. 13	300,000,000	23	Uneventful course. Cure. Post-Graduate Hospital. Service of Dr. Edward Quintard.
					Sept. 18	500,000,000		
					Sept. 23	600,000,000		
					Oct. 4	1,000,000,000		
7	J. R.	M.	16	19	Sept. 20	500,000,000	17	Uneventful course. Cure. Post-Graduate Hospital. Service of Dr. Edward Quintard.
					Sept. 25	600,000,000		
					Sept. 29	800,000,000		
					Oct. 4	1,000,000,000		
8	E. K.	M.	19	10	Sept. 20	500,000,000	23	Uneventful course. Cure. Post-Graduate Hospital. Service of Dr. Edward Quintard.
					Sept. 25	600,000,000		
					Sept. 29	800,000,000		
					Oct. 4	1,000,000,000		
9	M. R.	F.	17	7	Sept. 23	500,000,000	10	Uneventful course. Cure. Post-Graduate Hospital. Service of Dr. Edward Quintard.
					Sept. 27	600,000,000		
					Oct. 2	700,000,000		
10	A. R.	M.	2½	7	Sept. 23	150,000,000	8	Cure. Both tympanic membranes ruptured on last febrile day. Post-Graduate Hospital. Service of Dr. Chapin.
					Sept. 27	250,000,000		
11	C. S.	M.	39	13	Oct. 22	500,000,000	14	Cure. Ischiorectal abscess opened on last febrile day. J. Hood Wright Hospital. Service of Dr. Frank H. Daniels.
					Oct. 26	750,000,000		
						1,000,000,000		
12	E. M.	F.	20	7	Nov. 7	500,000,000	13	Uneventful course. Cure. French Hospital. Private patient. Dr. John Welsmiller.
					Nov. 11	600,000,000		
					Nov. 15	700,000,000		
13	D. J.	F.	27	18	Nov. 30	500,000,000	19	Death due to asthenia. J. Hood Wright Hospital. Service of Dr. H. B. Hanson.
					Dec. 4	750,000,000		
					Dec. 8	1,000,000,000		
					Dec. 12	1,100,000,000		
14	C. J.	M.	21	10	Nov. 16	500,000,000	21	Uneventful course. Cure. J. Hood Wright Hospital. Service of Dr. H. B. Hanson.
					Nov. 21	750,000,000		
					Nov. 25	1,000,000,000		
					Nov. 29	1,100,000,000		

There have then been reported so far a total of 475 cases of typhoid treated with vaccines. In this number of cases there have been 31 deaths, or 6.5 per cent., and 31 relapses, or 6.5 per cent. Omitting the 52 cases reported by Sadler, with his absurdly small dosage, we have 423 cases so far reported, with 23 deaths, or 5.4 per cent., and 31 relapses, 6.5 per cent. These cases come from widely separated sources, treated with a great diversity of dosage of vaccine, and with an equal variety of routine treatment, covering a period of three years. This number of cases,

with a death rate of 5.4 per cent., when contrasted with the usual death-rate in typhoid fever of well above 10 per cent., seems to offer a hope of a great reduction in the mortality when the vaccine treatment shall be more generally used and used earlier in the course of the disease. Especially do I wish to contrast this death rate of 5.4 per cent. in vaccine cases with the death rate of 16 per cent. in the Bellevue and allied hospitals in the years 1908, 1909, 1910, and 1911, quoted by Dr. Coleman.[15] Such a contrast must cause the most prejudiced to pause and consider. Any method of treatment that can show so low a percentage of deaths for 423 cases, be it coincidence or scientific achievement, is worthy a further trial.

Conclusions. 1. Vaccine treatment in typhoid fever will reduce the percentage of deaths and lessen the number of relapses.

2. Complications are less frequent in vaccine-treated cases, and the original attack seems to be shortened in some of the cases.

3. To give the best possible results, vaccine treatment should be instituted as early as it is possible to make a diagnosis, before the patient is exhausted and complications intervene.

STENOSIS OF THE DUODENUM; A STATISTICAL STUDY WITH THE REPORT OF A NEW CASE.[1]

By James M. Anders, M.D., LL.D.

PROFESSOR OF MEDICINE AND CLINICAL MEDICINE IN THE MEDICO-CHIRURGICAL COLLEGE PHILADELPHIA.

Congenital stenosis of the duodenum, which will be omitted from consideration in the present discussion, is properly classed among the rare intestinal conditions. On the other hand, the acquired form occurs less infrequently than has been supposed by internists in the past, and it invariably develops secondarily upon morbid processes either in the duodenum or adjacent organs.

More or less extensive studies of the subject from various viewpoints have been made by Leichtenstern,[2] Perry and Shaw,[3] Wilms,[4] Boas,[5] Laffer[6] and others, but the clinical characteristics of duodenal stenosis have received less study than their importance warrants. A careful consideration of the subject has revealed a somewhat close and interesting relationship between this condition and such common causative affections, as duodenal ulcer and carcinoma, and disease of the head of the pancreas, as well as other adjacent structures.

[15] Jour. Amer. Med. Assoc., 1912, lix, 363.

[1] Read at a meeting of the Association of American Physicians, May 15, 1912

[2] V. Ziemssen's Handb. der spez. Path. u. Ther., 2 Aufl., Band vii, 2, 411.

[3] Guy's Hospital Reports, 1893, l, 171.

[4] Bruns' Beit. z. klin. Chir., Tubin., 1897, xviii, 510.

[5] Diseases of the Intestines, 1901, 346.

[6] Ann. Surg., Philadelphia, 1908, xlvii, 1, 390, and 532.

Although numerous examples of stenosis of the duodenum will be presented hereafter, as the result of a statistical investigation, I venture to place the following new case on record, since it embraces certain details of interest and diagnostic value:

Mrs. S. B., aged fifty-six years, was admitted to the Medico-Chirurgical Hospital on Januray 5, 1912, complaining of pain in right hypochondrium and vomiting. Family history negative, excepting death of father from rheumatism. The patient had been in good health prior to four years ago, but since then has had several attacks of illness, which were diagnosticated acute gastritis. Habits were good, although she had used tea freely.

On December 21, 1911, following severe headache and a feeling of weakness, patient was seized with severe pain in right hypochondrium, which lasted about three minutes. This pain was not referred, but recurred three or four times daily, apparently without relation to the time of the ingestion of food, until date of admission to the hospital, and was somewhat relieved by vomiting. Following the first atack of pain, jaundice was noticed. After coming to the hospital, her condition showed marked improvement for a time; the attacks of pain and vomiting ceased, and the jaundice diminished considerably. There was some tenderness in the right hypochondrium and a small mass was palpable, which did not move with respiration. An *x*-ray examination did not reveal gallstones, but showed the pylorus to be in relation with the gall-bladder region, suggesting adhesions.

An examination of the urine revealed a trace of albumin, a small amount of bile, a trace of indican, and a few narrow hyaline casts. Cammidge reaction negative. A blood count on Januray 6, 1912, showed: Erythrocytes, 3,860,000; hemoglobin, 80 per cent.; and leukocytes, 11,600. Repeated examinations of the feces gave negative results.

On January 17, 1912, an examination of the gastric contents extracted one hour after a test breakfast, gave the following results: Reaction, acid; total acidity, 60; free HCl, 0.1 per cent.; lactic acid, negative; pepsin, present; starch digestion, stage of erythrodextrin; occult blood, negative; bile, negative; mucus, a small amount.

Up to this time, the patient's condition had been improving, but now vomiting recurred. There was no recurrence of the pain over the gall-bladder region, but the patient vomited frequently large quantities of bile-stained fluid. On January 23, there occurred a severe chill, and the pulse became more rapid and feeble. The temperature pursued a very irregular course, varying from a subnormal level to $101\frac{3}{5}°$ F. An examination of the blood at this time, showed a leukocytosis of 25,200; the differential leukocyte count resulted as follows: Polymorphonuclear cells, 81 per cent.; small lymphocytes, 7 per cent.; large lymphocytes, 11 per cent.; and eosinophiles, 1 per cent.

On January 26, Dr. Ernest Laplace operated and found the duodenum markedly adherent to the under surface of the liver, and kinked at the site of adhesions. Situated between the duodenum and the liver was the much shriveled gall-bladder. It was necessary to tear away liver tissue in breaking up the adhesions, leaving an excavation in the liver, considerable hemorrhage resulting. The gall-bladder could not be liberated from the duodenum, and owing to the patient's weakened condition, it was deemed advisable to desist before the operation was completed. The patient died three days later, and necrospy was refused. The stenosis of the duodenum in this case was due partly to the constricting cicatrix of an old ulcer and partly to the kinking occasioned by the adhesions. Among other points of interest presented by this case are compression of the gall-bladder and common duct, apparently due to the adhesions, either old or recent, accompanied by jaundice, and indications of a secondary acute inflammatory process obviously occasioned by perforation of the duodenum at the site of an ulcer.

The futher discussion of the subject of duodenal stenosis will be considered here in three aspects: (1) The incidence of the condition, including a collective investigation into the cases recorded in medical literature; (2) the etiologic and pathologic causes, and (3) the diagnosis.

1. THE INCIDENCE OF THE CONDITION, INCLUDING A COLLECTIVE INVESTIGATION INTO THE CASES RECORDED IN MEDICAL LITERATURE.

In 1898, Albu was able to collect only 43 cases from the literature, while Moynihan (1912) reports 56 cases from his own personal experience. I can report a totality of 262 collected cases. Albu's 43 cases, referred to above, were not added to those found in the literature in the present investigations, for the reason that this author's original paper could not be found. It should be stated, however, that 71 instances embraced in my statistics were recorded prior to the publication of Albu's article, and it is quite probable that these include many or all of his collection.

No cases of duodenal disease, which were found recorded in the literature, in which any doubt of actual stenosis existed, and of which there were many, are embraced in my series. In determining the existence of duodenal stenosis, I have been guided by either postmortem evidence or that revealed by operation, with a single exception, in which the notes left no room for doubt as to the diagnosis. The accompanying table (Table 1), which is largely self-explanatory, sets forth the names of the reporters and the references, the pathologic causes, whether the latter are intra- or extraduodenal, and also whether benign or malignant. Again the presence or absence of kinking is noted, and other points of unusual interest will be found in a separate column.

TABLE I.

Reporter.	Reference.	No. of cases.	Cause of stenosis.	Remarks.
A. de Haen	Rationes medendi, 1763, vi, 19	1	Compression by head of pancreas	Nature of pancreatic disease not mentioned.
Fullet	J. Univ. et Hebd. de med. et de Chir. Prat. Par., 1833, xiii, 33	1	Carcinoma of duodenum	Stomach enormously distended; perforation just below papilla.
Mondiere	Archives generales de Paris, 1836, 2, xii, 134	2	Carcinoma of pancreas	One case showed almost complete obstruction. Pancreas three times natural size in Case 2.
Holscher	Hannoversche Ann. f. d. gessamte Heilkunde 1840, Band v, 350	1	Carcinoma of head of pancreas	Complete for distance of three inches, not admitting goose quill.
Tanner	Prov. Med. Jour., 1842	1	Carcinoma of head of pancreas	Lumen size of goose quill.
Teisser	Jour. de Lyon, Nov. 11, 1847	1	Carcinoma of head of pancreas	Obstruction complete.
Chomel	Gaz. des Hôp., 1852, xxv, 37	1	Carcinoma of duodenum	Stenosis admitting little finger.
Arrachard	Gaz. des Hôp., 1860, 98	1	Carcinoma of duodenum	Stenosis almost complete.
Haley	Pacific Med. and Surg. Jour., San Francisco, 1873, 4, vii, 136	1	Carcinoma of duodenum	Stomach greatly distended; growth involving entire duodenum between pylorus and papilla.
Markoe	Tr. N. Y. Path. Soc., 1876, i, 265	1	Carcinoma of duodenum	Carcinoma six inches below pylorus, stercoraceous vomiting
Reynolds	Tr. N. Y. Path. Soc., 1876, i, 266	1	Carcinoma of duodenum	Stomach dilated; vomited large quantities.
Descroizille	France Med., 1876	1	Carcinoma of duodenum	Stenosis complete.
Salomon	Charite Annalen Jahrgang, 1877, iv, 144	1	Carcinoma of head of pancreas	Compressed ductus choledochus; extended into and caused ulceration of duodenum.
Dickinson	New York Med. Jour., 1879, xxx, 149	1	Carcinoma of duodenum	Extending from pylorus to jejunum and reducing duodenum to size of goose quill.
Rosenbach	Verhandlungen der Deut. Gesellschr. f. Chir., xi. Congress, 1882, 135	1	Gangrene of pancreas	Supra-papillary compression by peri-pancreatic abscess.
Cahn	Berl. klin. Woch., 1886, No. 22	1	Sarcoma of lymph glands	Enlargement of retro-peritoneal lymph glands compressing descending portion.
Gerhardi	Virchow's Archives, 1886, Band cvi, 303	1	Carcinoma of head of pancreas.	
Riegel	Zeitschr. f. klin. Med., 1886, xi, 187	1	Gallstone	Gallstone at mouth of common duct, permitting bilious reflux into stomach.
Hagenbuch	Deutsch. Zeitschr. f. Chir., 1887, Band xxvii, I u. 2, 110	1	Cyst of pancreas	
Hagenbuch	Deutsch. Zeitschr. f. Chir., 1887, Band xxvii, I u. 2, 110	1	Hematoma of pancreas	
Mason	Boston City Hospital Records, B. C. H. (unpublished), cclxiii, 26, cclv, 154	1	Carcinoma of duodenum	Opposite papilla; upper two inches duodenum dilated twice usual size.
Whittier	Boston Med. and Surg. Jour., 1889, cxxi, 377	2	Carcinoma of duodenum	In one case growth acted as valve, permitting regurgitation of intestinal contents.
Reiche	Jahrbuch d. Hamburger staotskranken anstalten, 1890, ii, 180, Case I	1	Peritoneal adhesions	Infra-papillary, admitting little finger.
Reiche	Jahrbuch d. Hamburger staotskranken anstalten, 1890, ii, 180, Case II	1	Carcinoma of duodenum	Infra-papillary.
Hochhaus	Berl. klin. Woch., 1891, 17, 409, Case I	1	Pressure of gallstone	Stenosis just below pylorus; perforation of gall-bladder and pressure due to stone; stomach dilated.

TABLE I—(*Continued*).

Reporter.	Reference.	No. of cases.	Cause of stenosis.	Remarks.
Hochhaus	Berl. klin. Woch., 1891, 17, 409, Case III	1	Kinking due to adhesions	Partial stenosis of pylorus; another stenosis at lower end of duodenum; no tumor nor thickening of duodenum.
Perry and Shaw	Guy's Hospital Reports, 1893, l, 171	6	Duodenal ulcer	
Perry and Shaw	Guy's Hospital Reports, 1893, l, 171	4	Carcinoma of duodenum	
Perry and Shaw	Guy's Hospital Reports, 1893, l, 171	2	Peritoneal adhesions	
Perry and Shaw	Guy's Hospital Reports, 1893, l, 171	5	Carcinoma of pancreas	
Perry and Shaw	Guy's Hospital Reports, 1893, l, 171	1	Carcinoma of liver	
Perry and Shaw	Guy's Hospital Reports, 1893, l, 171	4	Adhesions about gall-bladder	
Perry and Shaw	Guy's Hospital Reports, 1893, l, 171	4	Morbid growths	At least, two of these growths were of lymphatic origin.
Perry and Shaw	Guy's Hospital Reports, 1893, l, 171	1	Blood clot	
Perry and Shaw	Guy's Hospital Reports, 1893, l, 171	1	Aneurysm	
Perry and Shaw	Guy's Hospital Reports, 1893, l, 171	1	Kinking	
Lange	Ann. Surg., Phila., 1893, 588	1	Duodenal ulcer	
Fenwick	Cancer and other tumors of Stomach, 1893, 291	2	Carcinoma of duodenum	
Herhold	Charite Ann., 1894, xix	1	Peritoneal adhesions	
Pye-Smith	Tr. of Path. Soc., London, 1894, xlv, 63	1	Carcinoma of duodenum	
Schule	Berl. klin. Woch., 1894, No. 45	1	Gallstone	
Pic	Rev. d. Med., Paris, 1894, 1081; and 1895, 56. Obs., viii	1	Carcinoma of duodenum	"Growth" produced narrowing.
Mikulicz	Arch. f. klin. Chir., 1895, Band li	2	Obstruction by gallstones	Stones in diverticuli of cystic duct, which crossed and compressed duodenum.
Herz	Deutsch. med. Woch., 1896, No. 23, 362, Case I	1	Peritoneal band (tuberculous)	Stenosis complete; tuberculosis of peritoneum.
Herz	Deutsch. med. Woch., 1896, No. 23, 362, Case II	1	Cyst of head of pancreas	Infra-papillary stenosis; stomach not dilated; epigastric distention and pain, both relieved by vomiting of green material
Herz	Deutsch. med. Woch., 1896, No. 24, 379, Case III	1	Gallstone	At first, symptoms of supra-papillary stenosis, later those of infra-papillary, supposedly due to change of position of stone.
Herz	Deutsch. med. Woch., 1896, No. 24, 379, Case IV	1	Carcinoma of duodenum	Infra-papillary stenosis; tumor small, constricting duodenum.
Wilms	Bruns Beit. z. klin. Chir., Tubin, 1897, xviii, 510	1	Carcinoma of tail of pancreas	Caused infra-papillary stenosis.
Rewidzoff	Arch. f. Verdauungskr., Berl., 1898, iv, 369	1	Duodenal ulcer	
Wegele	Münch. med. Woch., 1898, No. 16	1	Obstruction by gallstones	
Aaron	Phila. Med. Jour., Feb. 4, 1899, 280	1	Carcinoma of duodenum	Supra-papillary, encircling duodenum.
Fenwick	Ulcer of Stomach and Duodenum, 1900, 45	2	Duodenal ulcer	
Siegel	Mitt. a. d. Grenz. d. med. w. chir., 1901, viii, 216	2	Carcinoma of pancreas	Infra-papillary.
Boas	Diseases of Intestines, 1901, 303	1	Carcinoma of duodenum	Supra-papillary.
Boas	Diseases of Intestines, 1901, 346	2	Impacted gallstones	Stones protruded from opening of common bile duct.

TABLE I—(*Continued*).

Remarks.	Reference.	No. of cases.	Cause of stenosis.	Remarks.
Boas	Diseases of Intestines, 1901, 350	2	Duodenal ulcer	Descending portion of duodenum; first portion much dilated.
Ochsner	Tr. Amer. Surg. Assoc., 1905, xxiii, 314	15	Sphincteric action of hypertrophied muscle	Infra-papillary; duodenum dilated; attributed to over-action of muscle, which normally retains chyme until mixed.
Delore	Lyon Med., 1905, cv, 446	1	Duodenal ulcer	Gastric dilatation.
Eve	Brit. Med. Jour., Lond., 1905, ii, 117	1	Duodenal ulcer	Stricture admitting tip of index finger one and one-half inches below pylorus.
Davis	Tr. Chicago Path. Soc., 1905, vi, 345	1	Duodenal ulcer, probably tuberculous	Admitting tip of little finger; stomach dilated; tuberculosis of spleen and epididymis.
Mackenzie	Jour. Amer. Med. Assoc., Aug. 4, 1906, 341	6	Duodenal ulcer	Advocates plastic operation on duodenum in case of "hour-glass contraction."
Eckersdorff	Münch. med. Woch., Oct. 30, 1906	1	Duodenal ulcer	Near pylorus and mistaken clinically for pyloric stenosis.
Gray	Scot. Med. and Surg. Jour., 1907, xx, 35	1	Duodenal ulcer	Mentions stenosis as urgent indication for operation; stenosis may be marked; probe passed with difficulty.
Bernheim	Amer. Med., April, 1907, 234	1	Duodenal ulcer	No operation or autopsy.
Leo	Deutsche. med. Woch., 1907, xxxiii, 1279	1	Not determined	Located below papilla; regurgitation of bile and and pancreatic juice into dilated stomach.
Bidwell	The Hospital, Lond., 1907, xlii, 547	1	Duodenal ulcer	Dilatation of stomach.
Laffer	Ann. Surg., Phila., 1908, xlvii, I, 390 and 537	27	Compression by root of mesentery	Found in 120 autopsies of 217 cases of acute dilatation of stomach from literature.
Codman	Boston Med. and Surg. Jour., 1908, clviii	1	Compression by root of mesentery	Causing chronic dilatation of stomach
Deve and Beaurain	Med. Mod., Paris, 1908, xix, 314	1	Compression by root of mesentery	
Mitchell	Tr. Roy. Ac. Med. of Ireland, 1908, xxvi, 76	1	Duodenal ulcer	Stomach dilated.
Berard	Lyon Med., 1909, cxiii, 283	1	Duodenal ulcer	
Sourdel	Bull. et mem. de la Soc. de Anat. de Par., 1910, lxxxv, 230	1	Peritoneal adhesions	Compression by peritoneal adhesions and infected lymphatic glands.
Abadie	Arch. Provin. de Chir., 1910, xix, 287	1	Ovarian cyst	
Cumston	Internat. Clin., 1911, vol. i, 21st ser., 139	1	Adhesions	
Cheney	Amer. Jour. Med. Sci., Mar., 1911, 328	1	Duodenal ulcer	Frequent vomiting.
Johnson	Ann. Surg., 1911, ii, 197	1	Band of adhesions	Operated three months previously for jaundice; repeated attacks of pain, vomiting, and fever.
Burke	Surg., Gyn., and Obstet., October, 1911	1	Duodenal ulcer	Two marked constrictions due to multiple ulcers; and causing hour-glass duodenum.
Mayo, W. J.	Ann. Surg., 1911-12, 313, and personal communication	55	Duodenal ulcer	Occurred in 553 cases of duodenal ulcer.
Bassler and Grant	Amer. Jour. of Gastro-enterology, Phila., April, 1912, 15	1	Carcinoma of duodenum	Duodenum thickened and contracted throughout; pancreas enlarged, hard and nodular.
Moynihan	"Duodenal Ulcer," 1912	56	Duodenal ulcer	Found at operation on 287 cases of duodenal ulcer.
Anders	Amer. Jour. Med. Sci., September, 1912, 360.	1	Kinking	Kinking due to adhesions to liver, resulting from duodenal ulcer.

2. THE ETIOLOGIC AND PATHOLOGIC CAUSES.

The relative frequency with which stenosis of the duodenum is occasioned by one or other of the primary etiologic conditions, is clearly indicated by the subjoined Table II, since it is believed that my figures furnish a trustworthy basis. It is worthy of note that by far the greater number—215 out of a total of 262 cases—are due to benign conditions, hence are in most cases, at least, amenable to timely surgical treatment. It is a matter of considerable interest that 185 or 70.88 per cent. of the cases were intra-duodenal in origin, and only 76 or 29.12 per cent. extra-duodenal. Cumston[7] found that compression outside the duodenum was by far the most frequent etiologic factor, but according to my own researches, this is true only after the exclusion of duodenal ulcer. Among the extra-duodenal conditions, which operated to produce stenosis were, diseases of the pancreas, compression by the root of the messentery, adhesions, morbid growths, kinking, gallstones, and of many others a single instance. The principal intra-duodenal causes were ulcer of the duodenum, carcinoma of the duodenum, sphincteric action of the muscular layer and gallstones.

TABLE II.

Causes of stenosis.	Cases.	Percentage.
Ulcer of duodenum	140	53.44
Compression by root of mesentery	29	11.07
Carcinoma of duodenum	23	8.78
Carcinoma of pancreas	16	6.11
Sphincteric action of muscular layer of duodenum	15	5.73
Adhesions	12	4.58
Gallstones	9	3.44
Growths	4	1.53
Kinking	3	1.14
Cysts of pancreas	2	0.76
Diseased head of pancreas (nature not mentioned)	1	0.38
Hematoma of pancreas	1	0.38
Gangrene of pancreas	1	0.38
Ovarian cyst	1	0.38
Carcinoma of liver	1	0.38
Sarcoma of lymph gland	1	0.38
Blood clot	1	0.38
Aneurysm	1	0.38
Not determined	1	0.38
Total	262	

As stated above, gallstones may also operate by compressing the duodenum from without, *e. g.*, when they occupy a diverticulum in the cystic duct. As a glance at Table I will show, stenosis due to kinking is rare, the numerical proportion being 3 to 262 cases. It is to be recollected, however, that in cases that come to necropsy without previous operation, kinking may not be recognizable, so that the condition may be more common than is indicated by these figures.

[7] International Clinics, i, 21st Series, 139.

3. THE DIAGNOSIS

In 1879, Leichtenstern[8] first called attention to certain symptoms, most of which are still recognized as being of major diagnostic importance in stenosis below the ampulla of Vater, namely, the absence of meteorism, the presence of biliary, but never fecal vomiting, the disappearance of the meteorism in the epigastrium after vomiting, and early anuria.

The cases are, for convenience of clinical study, divisible into four groups:

1. Those due principally to kinking of the gut. The diagnosis of duodenal obstruction due to kinking is always difficult, and in most cases quite impossible. The condition may be attended with colicky pains in the epigastrium, which often recur regularly from three to five hours after meals. A duodenal kink is, as was true of my case, occasioned usually by adhesions, which have been produced by an ulcer and other lesions. If the kink be located above the ampulla of Vater, it excites symptoms practically identical with those of pyloric stenosis, with this difference, however, that the former develop acutely, as a rule.

On the other hand, when the topographic position of the kinking is below the ampulla of Vater, as was true of my case, a prominent feature is oft-repeated vomiting of biliary secretion. In respect of its clinical indications, the condition also bears a close resemblance to cholecystitis, and acute stenosis of the same portion of the organ of intra- or extra-duodenal origin, for example, compression of the root of the mesentery as the result of ptosis of the intestines.

In cases due to kinking, as in the case I herewith report, the vomiting may develop suddenly, be oft-repeated, causing shock, and lead to exhaustion of the system. This symptom is less menacing to life in the commoner types of stricture of organic origin, since these induce a more gradual narrowing of the duodenal lumen than kinking. The painful paroxysms referable to the right epigastric region are also more severe and more frequent in acute stenosis than in more slowly developing types of the condition.

The points of difference here referred to (severe pains, more frequent vomiting, shock) may serve to separate the acute condition due to kinking and other causes, from the chronic varieties of stenosis, at least. The early recognition of the nature and significance of the indications of acute obstruction developed upon certain chronic processes is, for the sake of timely operative intervention, of the utmost importance.

2. Supra-papillary duodenal stenosis. When due to the more slowly acting causes than kinking, stenosis above the ampulla of Vater cannot be separated from pyloric constriction, as a rule.

[8] Loc. cit.

In cases in which a contracting ulcer has been the cause of the stenosis, there is usually a clear history of pain from one to several hours after having taken food and that the pain was relieved by vomiting, the latter symptom occurring one to two hours after the pain came on.

3. Stenosis at the ampulla of Vater. Cases in which the obstruction is situated opposite to Vater's ampulla, can be accurately diagnosticated during life, as a rule, although their characteristic symptoms differ in certain particulars from those of either infra- or supra-papillary stenosis. Healed duodenal ulcers, when situated at the orifice of the common duct in the duodenum, may obstruct both the pancreatic and common bile ducts, producing chronic jaundice and progressive emaciation. As pointed out by M. Wilms,[9] obstruction to both the discharge of the pancreatic juice and bile into the duodenum will naturally cause acholic stools with consequent jaundice, and feces rich in fatty elements. The usual gastro-intestinal symptoms dependent upon the absence of the biliary and pancreatic secretions, likewise ensue. In these cases marked dilatation of the stomach and of the duodenum above the seat of the stenosis usually occurs.

Boas[10] reports two cases in which the diagnosis of high calculus obstruction of the duodenum was made and verified by operation. In these instances of high incarceration of hepatic calculi in the common duct, the stone partly compressed the duodenum and partly protruded into its lumen. Neither blood nor bile were found in the vomitus and the stomach was dilated. Jaundice was present, and the stools were acholic and contained enormous numbers of fatty acid crystals.

4. Stenosis below the ampulla of Vater. In the more usual chronic type of infra-papillary stenosis of the duodenum, besides pain and vomiting of much biliary matter, other characteristic features are present. For example, the stools may show an absence of the coloring matter of the bile, being clay-colored, and, as Boas has pointed out, may at times present a lime-like consistence. Constipation is marked. Jaundice may be in evidence, although the greater number of the cases recorded, failed to show this symptom.

An analysis of the gastric contents by Boas, Riegel[11] and his pupil Honigmann,[12] and others, showed that free hydrochloric acid is usually absent in the infra-papillary variety, even in non-malignant stenosis; this is evidently ascribable to a free reflux of the alkaline intestinal juices from the duodenum to the stomach. In my case the percentage of free HCl present was about normal, but the gastric contents were not examined during the period of biliary

[9] Loc. cit.
[10] Loc. cit
[11] Zeitschr. f. klin. Med., 1886, xi, 187.
[12] Berlin. klin. Woch., 1887, No. 18

vomiting. The absence of two symptoms should be noted here, namely, intestinal meteorism and fecal vomiting.

It may happen, however, as in the case recorded by Lemoine,[13] that duodenal stenosis is bound up with narrowing of the transverse colon, in which cases fecal vomiting may be present. Dilatation of the stomach may occur, but is inconstant in infra-papillary stenosis. The epigastrium may be prominent, but the bowels are empty, as a rule. The epigastric distention subsides promptly, with relief from pain and oppression when present, after free emesis, but reappears in consequence of futher regurgitation of bile and pancreatic secretion from the duodenum into the stomach. Herz[14] emphasizes a green color of the vomitus as having much diagnostic significance. This opinion was corroborated by the color appearance of the vomitus in my own case. Stenosis of the jejunum cannot be distinguished from infra-papillary duodenal stenosis. Finally, the latent character of certain cases of partial chronic stenosis of the duodenum must be recollected.

THE COMPLEMENT-FIXATION TEST IN THE DIFFERENTIAL DIAGNOSIS OF ACUTE AND CHRONIC GONOCOCCIC ARTHRITIS.

By Hans J. Schwartz, M.D.,

INSTRUCTOR IN CLINICAL PATHOLOGY AND CLINICAL INSTRUCTOR IN DERMATOLOGY IN THE CORNELL UNIVERSITY MEDICAL SCHOOL, NEW YORK.

(From the Department of Clinical Pathology in the Cornell University Medical School, New York City.)

In a previous paper[1] the writer, in association with McNeil, drew attention to the value of the serum diagnosis of gonococcic infections in general. We there showed that in chronic gonococcic infection, even though limited to the genito-urinary tract, an antibody specific for the gonococcus could be detected in the blood. We showed that this reaction was specific for the gonococcus with the sole exception of meningococcic infection, but did not consider that this fact would detract from the practical value of the test, as there could be little difficulty in distinguishing between the two infections clinically.

We furthermore stated that in our opinion a positive reaction denotes the presence or recent activity in the body of a focus of living gonococci. A negative reaction does not, of course, exclude

[13] Bull. et Mém. de la Soc. Méd. des Hôp. de Paris, 1894, xi, 775.
[14] Deutsch. med. Woch., 1896, No. 23.
[1] Amer. Jour. Med. Sci., May, 1911.

the possibility of gonococcic infection being present, in the same way as a negative Wassermann reaction does not exclude the possibility of syphilitic infection. In this connection, however, there are two facts to be taken into consideration: (1) In the late lesions of syphilis, in common with the other infective granulomata, there is a distinct tendency for the fibroblasts at the periphery of the lesion to develop into definite connective-tissue cells. We may thus obtain the formation of a more or less well-marked connective-tissue capsule surrounding the lesion. As a result there is arrested activity on the part of the spirochetæ, a less amount of toxin is elaborated, the connective-tissue capsule offers some resistance to the free absorption of the toxins, and, as a result, there may be lessened antibody formation. This condition does not obtain in gonococcic infection, as the lesions here do not tend to become encapsulated. (2) The Wassermann reaction is definitely obscured by recent mercurial treatment. There is no treatment which thus obscures the complement-fixation test for gonococcic infection. On account of these two facts we think that more importance may perhaps be attached to a negative reaction in testing for gonococcic infection than is to be attached to a negative Wassermann test for syphilis.

Finally, we showed that the complement fixation test might be a distinct aid in finally deciding as to whether a patient was cured of his gonococcic infection, inasmuch as the blood test was positive in a certain percentage of cases where other means of diagnosis failed.

The technique of the test is given in detail in our previous paper,[2] and will not be repeated here.

In this paper we propose solely to deal with the application of the complement-fixation test to the differential diagnosis of gonococcic arthritis. The great majority of the cases have been studied in the wards of the second medical division of Bellevue Hospital and in the wards of the New York Hospital. We wish here to express our indebtedness to the attending physicians of the two hospitals for placing their abundant clinical material at our command.

The cases which follow are classified according to the clinical diagnosis throughout:

I. GONOCOCCIC ARTHRITIS; GONOCOCCI PRESENT.

CASE I.—Acute arthritis; right knee developed January 18, 1912. Abundant yellow vaginal discharge, in which gonococci were found; first noticed on January 21. Complement-fixation test made February 1 was strongly positive.

[2] Loc. cit.

CASE II.—Urethral discharge for two months; gonococci still present. Acute arthritis of both ankles; tenderness about the knees and at the lumbosacral junction present for nine days. Complement-fixation test positive. Symptoms promptly relieved by antigonococcic serum.

CASE III.—Male, aged twenty-two years. Urethral discharge for three weeks. Gonococci still present. Acute arthritis of both knees and ankles for eight days, accompanied by chills, fever, and sweating. Temperature reached 105° F. Blood examination showed 10,600 leukocytes, with 82 per cent. polynuclears. Widal and blood cultures negative. Complement-fixation test positive on August 12 (twenty-third day). Temperature gradually fell to normal, and patient was discharged from the hospital six days later, all symptoms having disappeared.

CASE IV.—Gonorrhea for three weeks; gonococci still present. Acute arthritis of left knee for three days. Complement-fixation test strongly positive. Much improvement on antigonococcic serum.

CASE V.—Gonorrhea for two months; slight discharge still present, in which gonococci are found. Arthritis of left elbow for four to five weeks. Complement-fixation test strongly positive. Improvement on antigonococcic serum.

CASE VI.—Arthritis of right shoulder, wrist, and sternoclavicular joint for two months. Gonococci present in vaginal smear. Complement-fixation test positive. Cured by vaccine treatment.

CASE VII.—Gonorrhea present for two months; gonococci still present. Five days ago began to suffer from fever, headache, and severe pain in the left wrist. Two days later wrist became swollen, tender, and painful on motion. Complement-fixation test positive. Left hospital three days later, so subsequent course could not be noted.

CASE VIII.—Arthritis of left elbow for six weeks. Gonococci present in vaginal smear. Complement fixation-test positive. Was improved by vaccine treatment.

CASE IX.—Gonorrhea for two months; gonococci still present in prostatic smear. Arthritis of right knee for three weeks. Had been treated with salicylates and colchicum without benefit. Complement-fixation test positive.

CASE X.—Patient has had gonorrhea for five weeks; gonococci still present. Five previous attacks of gonorrhea. Arthritis of left knee for four weeks. Complement-fixation test positive.

CASE XI.—Gonorrhea for six months; gonococci still present. Arthritis of left elbow for one month. Complement-fixation test positive. Improved by vaccine treatment.

CASE XII.—Patient was confined twelve days ago. A few days later arthritis developed, accompanied by fever and sweating. Both knees, both wrists, and left sternoclavicular joint involved.

Treated with salicylates for a few days without benefit. Vaginal smear positive. Complement-fixation test positive. Slow improvement under immobilization and baking.

CASE XIII.—Profuse vaginal discharge began three weeks ago. Arthritis of right knee began three days later, and has persisted in the same joint since. Treated for three weeks by salicylates, but without benefit. Vaginal discharge shows presence of Gram-positive cocci and some Gram-negative intracellular cocci (gonococci?). Complement-fixation test became negative very slowly, but on account of the history it was reported as probably a developing reaction.

Same case one week later. Gonococci definitely established in vaginal discharge. Complement-fixation test strongly positive.

CASE XIV.—Male, aged fifty-four years. Admitted to hospital December 7, 1911. Contracted gonorrhea three years ago and has had morning drop from time to time since. Present illness began five days before admission to the hospital, with a severe chill, fever, and pain in the right ankle; later, the right knee and shoulder, and still later in the other joints, so that on admission to the hospital practically all the large joints of the body were involved, being red, swollen, and tender. The urine contained a great many pus cells. The patient was given salicylates, colchicum, and salol from admission until June 3, with practically no improvement. The temperature ranged from 99° F. to 100.8° F. and the joint symptoms remained practically unchanged. About this time the patient first admitted having contracted a new gonorrhea some three or four days before the onset of his present illness. Urethral smear revealed the presence of gonococci. Treatment with gonococci vaccine was now begun and continued until the patient left the hospital, September 5. The initial dose was 50,000,000, and a gradually increasing dose was given every four to five days until a dose of 150,000,000 was reached. Under the treatment the temperature gradually dropped to normal and the joints gradually improved, so that when the patient left the hospital the inflammatory symptoms had entirely disappeared, only a certain amount of stiffness remaining. The blood was negative on the thirteenth, twenty-third, and thirty-sixth days of the disease. It was positive on the sixty-first day.

CASE XV.—Patient first noticed urethral discharge February 2. Acute arthritis of the right knee developed February 11, followed by involvement of the hip and ankle. On admission to hospital, February 16, patient had an acute multiple arthritis. The temperature ranged from 102° to 104° F. Profuse urethral discharge was present, in which abundant gonococci were found. White blood cells, 27,800. Polynuclears, 84 per cent. Was put on salicylic acid, gr. xx, and sodium bicarbonate, gr. xl, four times a day.

February 19: Blood culture and complement fixation were both negative.

February 21: White blood cells, 7500; polynuclears, 65 per cent. The temperature was still ranging between 102° and 104° F., and there was little change in the joint symptoms.

February 27: Complement-fixation test was strongly positive. The patient was put on gonococcic vaccine.

Case XVI.—Admitted to hospital October 14, 1911. The patient had gonorrhea eight years ago, lasting three months. One week after the gonorrhea began "rheumatism" of the right knee and ankle developed, which also lasted three months. No other joints were involved.

October 4: First noticed urethral discharge.

October 8: Right ankle and hip became painful, and the next day the ankle was swollen and tender.

October 15: Urethral smear showed abundant gonococci.

October 16: Blood culture and complement fixation test strongly positive for gonococcus. The patient was put on vaccine treatment, with resultant improvement.

Case XVII.—Acute arthritis of right knee for six weeks. No other joints have been involved. Venereal history denied, but intra- and extra-cellular, Gram-negative, biscuit-shaped diplococci were found in cervical smear. Complement-fixation test was strongly positive.

Remarks. In Cases I and XVI the reaction was positive on apparently the twelfth and thirteenth days of the disease respectively. We are, however, inclined to doubt the accuracy of the patient's statements in these two instances, inasmuch as our experience with the test so far has been that the reaction does not appear until the latter part of the third or the beginning of the fourth week. In support of this we would call attention to Cases XIII and XV. In Case XIII the reaction was negative on the twenty-first day of the disease, but became negative so slowly that it was reported as probably a developing reaction. Another examination made on the twenty-eighth day of the disease was strongly positive. In Case XV the reaction was negative on the seventeenth day of the disease and strongly positive on the twenty-fifth day. In Case XIV the reaction was negative on the thirteenth, twenty-third, and thirty-sixth days of the disease. It did not become positive until some time between the thirty-sixth and sixty-first day of the disease. On the sixty-first day of the disease the reaction was positive, but by that time the patient had received eight injections of gonococcic vaccine. The case was a very protracted one, recovery being exceedingly slow. The patient's resisting power to the gonococcus was apparently very low, as evidenced by the clinical course and the tardy development of antibodies.

This case is classified as negative in our statistics on account of the fact that a positive reaction could not be obtained until after the patient had received several injections of gonococcic bacterins. We feel, however, that further study will show such cases to be rare. Similarly, one occasionally obtains a negative Wassermann reaction, even in the presence of active secondary symptoms of syphilis.

In Case XII the date of the gonorrheal infection could not be ascertained. It was probably a case of gonorrhea occurring during pregnancy and remaining latent until the uterus was emptied, when it rapidly spread and became a general blood infection.

All the other cases of this group gave strong positive results, but we wish to emphasize here that a positive reaction is not to be expected earlier than about the beginning of the fourth week from the onset of the specific urethritis.

II. GONOCOCCIC ARTHRITIS TREATED WITH GONOCOCCIC VACCINE.

Ten cases of gonococcic arthritis under treatment with gonococcic vaccine for varying lengths of time and in varying doses have been examined. All 10 cases gave a strong positive result, as was, of course, to be expected, and goes to show that antibodies specific for the gonococcus are readily produced in the human system. These results really prove nothing as regards the etiology of the cases of arthritis in question. The same results would be obtained in any other form of arthritis or in healthy people after treatment with gonococcic vaccine. The cases are introduced here solely to bring forward the evident fact that the complement-fixation test is of no value in the differential diagnosis of arthritic cases that have recently been treated or are still under treatment with gonococcic vaccine.

III. CASES CLINICALLY DIAGNOSTICATED AS GONOCOCCIC ARTHRITIS, BUT IN WHICH GONOCOCCI COULD NOT BE FOUND.

1. *Cases Giving a Positive Complement-fixation Test*

CASE I.—Acquired gonorrhea two years ago. Says he has had two relapses since. Still has slight morning drop. Arthritis developed shortly after attack of gonorrhea began, left wrist, both knees, and bursa in front of right tendon Achillis being affected. Patient was laid up for three months and has never been free from joint troubles since.

CASE II.—Had gonorrhea twelve years ago. No urethral discharge at present. Prostatic smear not made. Acute arthritis of left knee began January 28, the knee becoming swollen, tender,

and painful. Temperature ranged from 98.2° in morning to 100.2° F. in evening from January 29 to February 4, after that it remained normal until patient was discharged February 21. Blood examination February 1: Leukocytes, 10,100; polynuclears, 82 per cent. Complement-fixation test positive February 1 and 8. Treatment: Sodium salicylate and sodium bicarbonate. Knee still somewhat swollen and painful when patient left the hospital, February 21. No other joints involved.

CASE III.—Gonorrhea began five months ago; no discharge for last three months, but urine still cloudy and containing a considerable number of pus cells. Tenderness, pain, and swelling of both knees and ankles for last six weeks.

CASE IV.—Had gonorrhea seven and three years ago. With each attack of gonorrhea the patient had rheumatoid pains in the body. Present attack of gonorrhea began three months ago and slight morning discharge is still present. Ten to fifteen days after the onset of the present attack of gonorrhea the patient noticed pain in both ankles, joints, and heels. Joints became swollen and painful a few days later, and this condition has persisted since.

CASE V.—Male, aged forty-two years. Admitted to hospital August 3, 1911. Has had gonorrhea several times and has had a stricture for some years. Has suffered from pains in hips, legs, and thighs at intervals for several years. One acute attack of rheumatism in ankles three years ago. For one week has had sudden intermittent pains in hips, knees, and shoulders, and joints are painful on motion. Pus cells in urine; gonococci not found. Treatment: Aspirin, gr. iv, every fourth hour. Still had considerable pain on discharge, August 8, 1911.

CASE VI.—Admitted to the hospital August 11, 1911. Has had gonorrhea seven times, and with each attack a multiple arthritis has developed, the toes, ankles, vertebral, and sternoclavicular joints being involved. The present illness began one week ago with chills and diarrhea. The following day pains developed along the spine and in the feet. The small joints of the feet became slightly swollen and painful, and also pressure on the heels and on the seventh cervical and first dorsal vertebræ. The temperature on admission was 101.5° F., but dropped to normal in a few days. Prostatic smear showed the presence of some pus cells, but gonococci could not be demonstrated.

CASE VII.—Patient first complained of vaginal discharge and burning micturition about August 15. Acute arthritis of left elbow began August 23. Gonococci could not be demonstrated in the vaginal discharge. On September 5 the complement fixation test was positive. The patient was treated by gonococcic bacterins, with slow but ultimate recovery as regards the inflammatory symptoms, though stiffness persisted for a long period. Subsequent blood examinations on September 26 and November 9 were positive

as was, of course, to be expected while the patient was receiving injections.

CASE VIII.—Admitted to the hospital February 29. Gives history of gonorrhea eight year ago. Patient states that ten days ago a urethral discharge appeared, which was followed four days later by an acute arthritis of the right knee and ankle. When admitted to the hospital no discharge could be obtained from the meatus. Smears made from the urethra and prostate revealed very few leukocytes, but no Gram-negative organisms. The complement-fixation test was strongly positive on February 29.

CASE IX.—Patient had gonorrhea four years ago, lasting two months. Recurrence or reinfection one year later and again the following year. With the third attack gonococcic arthritis began and has practically incapacitated him since. The heels, both knees, shoulders, elbows, wrists, and temperomaxillary joints have been at various times affected. Urine is clear, excepting some large pus shreds; after prostatic massage the urine is cloudy and contains many pus cells. Gonococci not found.

REMARKS. Case V did not remain sufficiently long under observation to make the diagnosis absolute. It seems, however, fair to assume that the patient was suffering from the arthralgic type of the disease, in which there are wandering pains about the joints without redness or swelling. These may persist for a long time. Case VII was a typical case of gonococcic vaginitis and arthritis, but gonococci could not be demonstrated in the smears made from the vagina and cervix. It serves to emphasize the well-known fact of the difficulty and uncertainty of diagnosticating gonococcic infection in women by means of urethral or cervical smears. Case VIII is of some interest. The patient states that ten days before admission to the hospital a urethral discharge appeared which he looked upon as a fresh gonorrheal infection. Examination at the time of admission, however, showed no urethral discharge. Smears made from the urethra and prostate revealed few leukocytes and no Gram-negative organisms. The blood was strongly positive ten days after the supposed date of infection. Personally we are inclined to doubt the accuracy of the patient's statements, as we have never seen a positive reaction develop so early in the course of the disease. Extended comment on the remaining cases of this group does not seem to be necessary. A study of the individual case records would seem to support the correctness of the clinical and serum diagnosis.

2. *Cases Giving Negative Complement-fixation Test.*

CASE I.—Acute arthritis of right knee began six months ago, the knee becoming greatly swollen and painful. Some time after this a vaginal discharge was first noticed, which has persisted since. On admission to the hospital February 23 the right knee was found to be much swollen and there was marked tenderness

over the patella and the external and internal condyles of the femur. There was a profuse yellow vaginal discharge containing many organisms, but gonococci could not be demonstrated. Temperature normal. No evidence of tuberculosis. Treatment consisted of immobilization, tonics, etc., but with little improvement.

CASE II.—Admitted to hospital May 1, 1911. Patient developed gonorrhea about April 15; was treated for one week, when severe pains in left knee and in metatarsophalangeal joints of both feet developed. He was taken to the hospital on April 23, and remained until April 30, when he was discharged cured. Readmitted May 1 for same trouble, the left knee, metatarsophalangeal joints of both feet, and both heels being tender, painful, and swollen. Urethral discharge present contained many pus cells, but no gonococci could be found. Complement-fixation test negative on May 2. Symptoms subsided rapidly under treatment with salicylic acid and sodium bicarbonate, and patient was discharged May 8.

CASE III.—Male, aged twenty-eight years. Admitted to the hospital August 1. Has had urethritis for eighteen months; still slight discharge from meatus in morning; gonococci not found. Right wrist and left knee became suddenly swollen, hot, painful, and tender seven months ago. Later nearly all joints of body became involved at various times. Began to get better three months ago, but pain and stiffness persisted. On admission to the hospital the right wrist was found swollen, deformed, not painful on motion, but its use limited. Left knee slightly swollen. Nearly all other large joints of body showed same tenderness and limitation of motion, but no swelling. Treatment consisted of aspirin, gr. x, every fourth hour, codliver oil, and iron. Patient complained of very little pain after August 3, and was discharged on August 22, 1911.

CASE IV.—Female, single, aged twenty-eight years. Admitted to hospital December 29, 1911. History of rheumatism in family. Venereal history denied. No previous history of arthritis. For last two months gradually increasing pain in right ankle, so that she had to stop work one month ago. The ankle was swollen, especially at night, less so in the morning. One month ago the left elbow and shoulder began to feel stiff in the morning, but did not become swollen. Slight burning on micturition for last two months. Her present condition shows the right ankle and a distance of two inches above it uniformly swollen; skin hot and dry; tissues soft; no edema; some fluid in joint; active and passive motion painful; no crepitus. Heart normal. No vaginal discharge. Urine contains a few white blood cells. Wassermann reaction negative. Temperature during her stay in the hospital ranged from 98° to 100° F. in the morning and from 101° to 104° F. in the evening, and was irregular in type. Treatment throughout consisted of salicylic acid, aspirin, and strychnine. From January 26 to February 2,

four doses of gonococcic vaccine were given, beginning with 62,000,000 and ending with 100,000,000 without any material influence on the temperature. Patient left the hospital February 3, fairly comfortable, but with still considerable swelling and tenderness of ankle. The temperature was still ranging from 100° F. in the morning to 104° F. in the evening.

REMARKS. On account of the clinical course and prompt response to treatment with salicylates it seems to us that in Case II the clinical diagnosis is perhaps open to question. Even though the diagnosis of gonococcic arthritis and urethritis be accepted, we are not surprised at obtaining a negative complement-fixation test. The blood was taken on the seventeenth day of the disease, and, as a rule, the reaction does not appear so early. Cases I, III, and V are undoubted instances of infectious arthritis. In view of the negative findings as regards gonococci and the complement-fixation test it seems to us that the diagnosis of gonococcic arthritis must be accepted with reserve. A search for some other organism as the etiological factor seems to be indicated. The irregular type of temperature observed in Case V, ranging as it did from 98° to 100° F. in the morning to 101° to 104° F. in the evening throughout the patient's stay in the hospital, seems also to be rather against the diagnosis of gonococcic arthritis.

IV. ARTHRITIS DEFORMANS.

1. *Cases Giving a Negative Complement-fixation Test.*—Fifteen typical cases of arthritis deformans are included in this group. All gave a history of chronic deforming arthritis, with acute exacerbations extending over a period of from one to eight years. In all, the small joints of the extremities were chiefly involved, though in many there was also involvement of various other joints, such as the wrists, elbows, knees, ankles, temporomaxillary joints, and cervical vertebræ. The condition varied from slight stiffness, swelling, and deformity in the early cases to marked enlargement of the ends of the bones with almost complete ankylosis and muscular wasting in the more advanced cases. Fourteen of the cases denied a venereal history, and urethral and vaginal smears were negative in all. Two of these cases dated the onset of the arthritis from childbirth some years before, but in neither could any organism be isolated, though they were both probably due to an infectious process beginning at that time. One case showed some thickening of the Fallopian tubes, but smear and culture from the cervix also proved negative. Two cases had had leucorrheal discharge for some years, but gonococci could not be demonstrated, although many other organisms were present, for example, Gram-negative bacilli and cocci and Gram-positive diplococci.

Another case was that of a female, aged forty-five years, single, and giving no venereal history. Vaginal smear showed no pus cells, but many cocci and bacilli, no Gram-negative diplococci. This patient had an infection of the antrum of Highmore and from this focus the Bacillus pyocyaneus, Bacillus mucosus capsulatus, and the pseudodiphtheria bacillus were isolated. The patient's serum was tested for complement-fixative bodies, with an antigen prepared from each of these organisms separately. The results were all negative, so none of these organisms could be looked upon as an etiological factor in connection with the arthritis. The bacteriological work in this case was done by Dr. W. Elser, of the Cornell Medical School, who kindly furnished us with the cultures from which the antigens were made.

The only case of arthritis deformans giving a venereal history was a male who had had the arthritis for fourteen years, periods of exacerbation alternating with periods of quiescence. He had had gonorrhea five years and one year previously. At the time the blood examination was made the urine was clear and gonococci could not be demonstrated in a prostatic smear.

V. ACUTE RHEUMATIC FEVER.

All of these cases were typical examples of the disease. They were all characterized by sudden onset, high fever, acid sweats, and polyarthritis, with the usual marked tendency to flit from one joint to the other. Many showed cardiac involvement and all yielded promptly to salicylates.

1. *Cases Giving a Negative Complement-fixation Test.* Twenty-three of these cases denied all venereal history and urethral and vaginal smears were negative in all. Four cases gave a definite history of having had gonorrhea, but in none was there any evidence of the disease at the time the blood test was made. They were all males and prostatic smears were negative in all.

2. *Cases Giving a Positive Complement-fixation Test.* One case was a female with profuse vaginal discharge, in which Gram-negative intra-cellular diplococci were found. Another case was a male who had had gonorrhea several times. His prostate was tender on palpation and many pus cells were found in the urine after prostatic massage. There were some Gram-negative extra- and intra-cellular cocci. Finally, there was another female with thick purulent vaginal discharge. Gonococci could not be demonstrated, but clinically the condition was one of gonorrheal endocervicitis. There is little doubt that all 3 patients were suffering from gonorrheal infection as well as acute rheumatic fever. They have been classified as acute rheumatic fever rather than gonococcic arthritis on account of the clinical picture, especially the distinct tendency for the joints to be involved successively and also on account of the prompt

response to treatment with salicylates. These cases have been cited here to emphasize the point that the complement-fixation test merely diagnosticates the presence of gonococcic infection somewhere in the body; but this, of course, does not preclude the possibility of some other infection being present at the same time.

VI. CASES OF ARTHRITIS IN WHICH NO DEFINITE CLINICAL DIAGNOSIS HAD BEEN MADE AT THE TIME THE BLOOD WAS EXAMINED.

1. *Cases Giving a Positive Complement-fixation Test.*

CASE I.—Urethral discharge for one month; slight in amount now; gonococci not found. Acute arthritis of left knee for three days. The diagnosis lay between acute rheumatic fever and gonococcic arthritis. As a result of the positive blood finding the patient was put on antigonococcic serum, with prompt relief.

CASE II.—Case of chronic multiple arthritis. Venereal history present. Urethral and cervical smears negative for gonococcus. Purulent salpingo-oöphoritis found on examination. The complement-fixation test was positive September 7, 1911. A panhysterectomy was done October 11, which was followed by considerable improvement in the joint symptoms. The complement-fixation test was still positive November 9, 1911, which was to be expected, as, in our experience, it takes six to eight weeks for the reaction to disappear from the blood after the focus of infection has been removed.

CASE III.—Female, aged twenty-seven years. Venereal history denied. Has had severe pain and swelling in the left knee for six weeks. No fluctuation could be made out in the joint. Cervix is large and soft; considerable vaginal discharge; gonococci not found. Temperature normal throughout. Treatment consisted of immobilization and baking, but improvement was gradual and slow. Was given antigonococcic serum, after which the pain was distinctly less, but the swelling remained the same, in which condition the patient left the hospital after a stay of five weeks.

CASE IV.—Male, aged twenty years. Venereal history denied, but some shreds were found in the urine. Prostatic smear negative. Acute arthritis of right wrist for three weeks not relieved by salicylates. Was subsequently cured by vaccine treatment.

CASE V.—Acute arthritis of left ankle for one month. Venereal history denied, but shreds were found in the urine. Prostatic smear not made. Had been thoroughly treated for one month with salicylates, colchicin, and potassium iodide, without relief. Dr. W. Gilman Thompson, in consultation, made the diagnosis of gonococcic arthritis, and suggested that a complement-fixation test be made. This turned out to be positive, but the patient was lost sight of shortly afterward so the final result is not known.

CASE VI.—(The following notes are abstracted from Dr. Geo. K. Swinburne's[3] paper). Patient had had a painful arthritis of the knee for eighteen years, during all of which time it had been treated as tuberculous. He had to wear a brace almost constantly, and was frequently laid up in bed for weeks at a time. He gave a history of having had gonorrhea when aged thirteen years and when aged fifteen years his arthritis began. When aged twenty-three years he had a second attack of gonorrhea, which only lasted a short time. The possibility that he was suffering from gonococcic arthritis having been suggested to him, the patient had an *x*-ray picture taken, which showed that the joint was not a tuberculous one. The patient then consulted an orthopedic surgeon, who stated that the joint looked like a gonococcic arthritis. He then consulted Dr. Geo. K. Swinburne, who kindly referred him to me for a complement-fixation test. This proved to be positive. Dr. Swinburne then put the patient on a course of gonococcic bacterins. Steady improvement began almost at once as regards the pain, and finally resulted in complete cure as regards the inflammatory symptoms, though considerable ankylosis of the knee remained.

CASE VII.—Had gonorrhea twelve years ago; no signs present now; prostatic smear negative. Has had acute arthritis of right knee for three weeks. Cultures from knee-joint negative. After the blood test was made the patient was treated with gonococcic vaccine, which resulted in distinct improvement.

CASE VIII.—Male, aged thirty-seven years. Admitted to the hospital April 4. The patient spoke no English, so no history could be obtained. No urethral discharge; prostatic smear not made. Disease began eight days ago. At present his left elbow is slightly swollen and tender; index, ring, and little fingers of right hand swollen and tender; both knees and ankles tender, but not swollen. Temperature on admission 102° F. The case was at first looked upon as one of acute rheumatic fever and the patient was put on salicylic acid, gr. xx, and sodium bicarbonate, gr. xl., every fourth hour, under which the joint symptoms subsided and the temperature fell to normal on April 7. On the following day the joint symptoms again became worse and the temperature began to rise, reaching 102° F. on April 11. On April 13 the temperature again became normal and remained so until April 22. The joints during this period improved somewhat, but still caused the patient considerable pain. On April 23, while still under salicylates, another relapse began and lasted until May 1. The temperature during this period rose to 102° F., and all the joints become acutely inflamed again. From May 1 the temperature remained normal and the joint symptoms were less severe until the patient left the hospital May 5. He returned, however, a few days later suffering from another relapse,

[3] Arch. Diag., July, 1911.

and was sent to the City Hospital on Blackwell's Island, so the subsequent course is not noted. The complement-fixation test was made on May 2 during a period of quiescence, and the patient left the hospital three days later, so that vaccine or serum treatment was not instituted.

CASE IX.—Female, aged twenty-nine years, single. Has had slight leucorrhea from time to time. None for some months. Venereal history denied. Had slight burning pain on micturition seven to eight weeks ago, which only lasted a few days. About five weeks ago began to suffer from pain in left instep, later in toes, and still later the ankle became red, swollen, and painful. The instep and toes became well, but the ankle has remained affected. No fever, no cough. Has had night sweats since onset of trouble, and has lost considerable weight. Physical examination negative, except as regards the left ankle, which is swollen and tender, especially about the tendo Achillis. No vaginal discharge. Smears made from urethra and cervix negative for gonococcus. *X*-ray picture showed slight erosion of the tip of the astragalus, which led to the suspicion of the joint being a tuberculous one, and the patient was transferred to the surgical wards. The complement-fixation test was strongly positive.

CASE X.—Female, aged twenty-four years, single. Admitted to the hospital September 25. Previous history negative. Three days before admission the third finger of the left hand and the right wrist became red, swollen, tender, and painful on motion. This condition has persisted without any new joint involvement. The urine contained many leukocytes, but gonococci could not be found in the urethral or cervical smears. The treatment at first consisted of aspirin, gr. x, and sodium bicarbonate, gr. xx, every second hour, but was without any influence on the temperature or joint symptoms. The blood examination was positive on September 28 and on October 8, and the patient was put on gonococcic vaccine. She received seven injections during the period from October 8 to October 30. The initial dose was 10,000,000 and the last one 65,000,000. Under this treatment the temperature, which had been ranging from 98° F. to 100° F., gradually subsided until it reached normal on October 18 and remained so until her discharge. The joint symptoms also distinctly improved, though more or less pain was still present in the wrist when the patient left the hospital December 2.

REMARKS. Case II illustrates the persistence of a positive reaction in the blood for four weeks after the focus of infection had been removed. This is to be expected, as in our experience it takes six to eight weeks for the reaction to disappear from the blood after the toxins responsible for the production of the antibodies have ceased to be elaborated.

In Cases IV and V the patients both absolutely denied venereal

history, but the presence of a few shreds in the urine aroused more than a suspicion that their statements were untrue. In Case IV the subsequent course confirmed the correctness of the blood test. Case V was lost sight of shortly afterward, but there is little doubt that he also was suffering from gonococcic arthritis.

In Case VIII the diagnosis of gonococcic arthritis may seem open to question. On the other hand the distinct tendency to relapse even under heavy doses of salicylates would make one question the diagnosis of acute rheumatic fever. In our opinion the positive complement-fixation test in such a case would justify a course of gonococcic bacterins, and it is unfortunate that this could not be done.

Case IX again illustrates the difficulty and uncertainty of diagnosticating gonorrheal infection in women by means of the history or by examination of urethral and cervical smears. In this case there was no vaginal discharge and urethral and cervical smears were negative for gonococci. It was only on close questioning after the positive report on the blood had been made that the patient admitted practising promiscuous sexual intercourse, and said that she had had intercourse shortly before the attack of burning micturition, which occurred seven to eight weeks before her admission to the hospital and two weeks before the onset of her arthritis. It seems fair to conclude, therefore, that the patient contracted gonorrhea at that time and that the joint condition was a gonococcic arthritis.

In Case X also the complement-fixation test gave the only positive proof of gonococcic infection and the correctness of the diagnosis was borne out by the subsequent course.

2. *Cases Giving a Negative Complement-fixation Test.*

Case I.—Male, aged forty-one years. Venereal infection denied. Admitted December 1. Present illness began four weeks ago with pain in the upper part of the chest, then the left shoulder became painful, swollen, and red. This was followed in turn by the left wrist and elbow, left ankle, hip, and knee. Present condition: Redness, swelling, heat and pain, tenderness, and limitation of motion in the left wrist and both ankle-joints. Pain, tenderness and slight limitation of motion in the left shoulder and the left sternoclavicular joints. In the left hip and knee-joints no crepitation, no bone changes. No urethral discharge; no discharge after prostatic massage. Patient was put on salicylates, but no material improvement had taken place when he left the hospital December 7.

Case II.—Acute gonococcus urethritis for one week; acute arthritis of right knee for three days. The patient unfortunately left the hospital before the diagnosis could be definitely established

Case III.—Rheumatoid affection of the spine for three years; had gonorrhea and prostatitis seven years ago.

CASE IV.—Female, aged thirty years. Patient has suffered from recurring attacks of arthritis of right ankle since aged thirteen years. The attacks recur at intervals of six months and last from one to three weeks. The pain is distinctly worse at night whether the foot has been used much or not. The tenderness is localized to a point over the external malleolus. The present attack has lasted about four weeks. A double salpingectomy was performed two and one-half years ago. Copious vaginal discharge now present; gonococci not found. The diagnosis rested between gonococcic arthritis and tuberculosis, and the complement-fixation test seemed to bear out the latter diagnosis.

CASE V.—A case of chronic deforming arthritis of many years' duration in a child aged thirteen years. Both knees and both elbows were involved. Looked upon as a case of Still's disease.

CASE VI.—Male, aged twenty-nine years. Contracted gonorrhea five years ago. Two months later, before the gonorrhea was cured, rheumatism developed, which lasted four months. Practically all the joints in the body were involved at that time, including the heels. Gonorrhea again three years ago, lasting until two months ago. None since. Present illness began eleven weeks ago and practically all the joints in the body have been affected since. The heels again were affected. On account of this involvement of the heels the possibility of gonococcic arthritis was first considered. The urine was, however, quite clear, prostatic smear was negative for gonococcus, and the complement-fixation test was also negative. The symptoms responded promptly to salicylates, showing that the case was undoubtedly one of subacute rheumatism.

CASE VII.—Patient gave a history of chronic arthritis of the hip-joint for two and one-half years. Venereal history denied; prostatic smear negative for gonococcus.

CASE VIII.—Female, married. Admitted to hospital February 19. No history of venereal disease. Present illness began about six months ago, with acute involvement of the right wrist and metacarpophalangeal joints, both knees and both elbows. Under treatment for "rheumatism" all the joints became well in about two weeks except the left elbow and the left knee, in which the condition has persisted. Both these joints on admission to the hospital were swollen, tender, and contained fluid. No vaginal discharge present. Urethral and cervical smears negative for gonococcus. Gonococcic complement-fixation test and blood culture and Wassermann reaction all negative. The temperature was practically normal from admission until February 25, when a slight rise in temperature took place, ranging from 99° to 101° F., and persisted until the patient left the hospital March 4.

REMARKS. In Case I there was no reason to suppose that the condition was one of gonococcic arthritis. The diagnosis rested between arthritis deformans and subacute rheumatism, but the

patient left the hospital before the diagnosis could be absolutely established.

Case II was probably one of gonococcic arthritis, but as the gonorrheal infection had only lasted one week when the blood was taken the reaction was, of course, negative. This case also left the hospital before the diagnosis was definitely established.

In Case IV the arthritis began when the patient was aged thirteen years, a fact in itself rather against the diagnosis of gonococcic arthritis. It is, of course, possible that the patient had gonorrheal infection at that time, but there was no history of vaginal discharge until years after the arthritis had begun.

Case VI serves to bring out the point that too much stress must not be laid on involvement of the heel in making the diagnosis of an arthritis, though undoubtedly the majority of the cases of talalgia are of gonorrheal origin.

Case VIII was undoubtedly one of infectious arthritis, but all the evidence was against its being of gonorrheal origin.

VII. OTHER JOINT AFFECTIONS.

Three cases of gout, all of whom denied venereal history and in whom prostatic smears were negative, gave a negative complement-fixation test. One case of gout admitted having had gonorrhea four times and had many pus cells in the urine. Gonococci could not be found and the blood test was negative. One case of syphilitic arthritis denying gonorrhea gave a negative gonococcic complement-fixation test and a positive Wassermann reaction. Another case of syphilitic arthritis admitted having had gonorrhea four times, the last time thirteen months ago. Some shreds were present in the urine, but gonococci could not be found. This case also gave a negative gonococcic complement-fixation test and a positive Wassermann reaction. Both cases responded promptly to treatment with Hg and KI. Three cases of multiple infectious arthritis from which the Streptococcus viridans was isolated from a local focus of infection gave a negative gonococcic complement-fixation test, as did another case in which a hemolysing streptococcus was isolated from the blood. Finally, in one case of tuberculous arthritis in which venereal history was denied, the prostatic smear was negative. Here a positive von Pirquet reaction was obtained and also a reaction to tuberculin injected subcutaneously. Cultures from the knee-joint were negative. The gonococcic complement-fixation test was also negative.

From our work so far we would state that in our opinion a positive complement-fixation test is an absolute indication of gonococcic infection somewhere in the body.

A positive reaction should not be expected earlier than about the beginning of the fourth week from the onset of the infection.

SUMMARY.

Clinical diagnosis.	Total number cases.	Positive.		Negative.	
		No.	Per cent.	No.	Per cent.
I. Gonococcic arthritis; gonococci present	17	16	94.1	1	5.9
II. Gonococcic arthritis, treated with bacterins	10	10	100.0	0	0
III. Gonococcic arthritis; gonococci not found	13	9	69.2	4	30.8
IV. Arthritis deformans	15	0	0	15	100.0
V. Acute rheumatic fever:					
(a) uncomplicated	23	0	0	23	100.0
(b) with gonorrhea	3	3	100.0	0	0
VI. Cases for diagnosis	18	10	55.5	8	44.5
VII. Other joint affections	11	0	0	11	100.0

A positive reaction is obtained in a certain number of cases of gonorrhea where bacteriological examination fails. This is especially the case in women.

A negative reaction does not exclude gonococcic infection, but is to be given some weight on account of the reasons detailed earlier.

It is to be remembered that gonorrhea is a common affection in both sexes. This fact should not be lost sight of in interpreting a positive result in connection with any given case of arthritis. A person may suffer from two infections: for example, acute rheumatic fever and gonorrhea, as shown in the preceding records.

Interpreted, however, in the light of the clinical history and clinical findings it seems to us that the complement-fixation test should prove an addition to our means of diagnosis between gonococcus arthritis and other forms of arthritis of obscure etiology.

A CRITICAL COMMENTARY ON THE FREE EYE INFIRMARY, WITH SUGGESTIONS AS TO REFORMS IN OPHTHALMIC HOSPITALS, DISPENSARIES, AND SCHOOLS.

A COMPILATION FROM CORRESPONDENCE AND OBSERVATION.

BY H. V. WÜRDEMANN, M.D.,

EDITOR "OPHTHALMOLOGY;" ASSOCIATE EDITOR "OPHTHALMIC RECORD;" FORMERLY PROFESSOR OF OPHTHALMOLOGY, MARQUETTE UNIVERSITY; CHAIRMAN, SECTION ON OPHTHALMOLOGY, AMERICAN MEDICAL ASSOCIATION, 1901, SEATTLE, WASHINGTON.

SUGGESTIONS from several teachers and members of the staffs of ophthalmic institutions inspired an inquiry by the writer into alleged conditions which necessitated correspondence with promi-

nent ophthalmologists and teachers in practically all civilized countries.

After certain inquiry had been made by such means, the material gathered was worked up with the author's own notes and a draft submitted to a number of confreres, who made critical remarks as to the material therein contained, necessitating corrections and additions in order that the subject might be authoritatively presented.

A few correspondents, for reasons evidently connected with their own appointments, begged to be excused from participation in a joint article, as was the original intention, and thus their names are not herein quoted. Some of them expressed the fear that the necessarily diverse views of men working in such different surroundings and scattered over the world, could not be harmoniously collated in one article.[1]

The majority agreed with most of the criticisms and suggestions, and some with all, most of them giving additional ideas noted with their names. Wicherkiewicz, Cracow, says that it is a happy idea. Casey A. Wood, Chicago, and Hiram Woods, Baltimore, say that such an inquiry or statement may do a great deal of good, but that harsh words and antagonism may perhaps be expected by the author who shoulders such a responsible position. F. Maynard, Calcutta, says that it cannot serve a useful purpose.

A soldier who criticises the army, an official who finds fault in a department, or one who points out the errors and defects of a system of which he is a part will not lack criticism, vilification, and implications of base motives by some at least of his colleagues, for "there are those whom it is hard to move."[2] Therefore, as the writer has had some twenty years' experience in such positions, has been a critical observer of many such institutions both at home and abroad, and as he at present does not hold any such relations; except where otherwise quoted, the reader will ascribe to him the responsibility of these comments, remembering that some of the authorities do not accept the whole of the revised article even as it is here printed.

The criticisms contended for are general in their application, and local conditions must modify and govern them in all instances. What is true in American cities is not necessarily true in European cities, and *vice versa*, and criticisms intended in one country (herein mostly America) may not equally apply to all others.[3]

Some of the suggestions herein made may be looked upon as Utopian.[4] Some of our colleagues do not think that the criticisms

[1] Casey A. Wood, Chicago; F. Maynard, Calcutta; Henry R. Swanzy, Dublin.

[2] Marcel Danis, Brussels.

[3] Casey A. Wood, Chicago; Hiram Woods, Baltimore; Fredk. R. Cheney, Boston; J. Bistis, Athens.

[4] H. R. Swanzy, Dublin.

apply in their localities,[5] but these particular teachers have institutions and clinics which are eminently noted as the Mecca of ophthalmic students and only in minor details can any criticisms be made. Other correspondents, while agreeing with these contentions, do not care to be quoted, owing to their personal relations with certain institutions of which they well know the failings. Practically all of the correspondents accept the majority of the suggestions originally submitted for criticism.

Thus this essay may be looked upon as an editorial compilation, the assumed author thereof being the translator of what may be esteemed a matter of world-wide observation and cosmopolitan comment. We believe that our contentions are sufficiently well subserved without going into personalties and distinctions of institutions or localities, and no particular men or institutions are herewith noted. The manifest excellencies of many institutions, their good equipment, and the high quality of their teaching is borne in mind.

The necessity for the existence of charitable institutions for the relief of the diseases of the poor is evident, especially in some countries:[6] (1) For charity's sake; (2) on account of the economic importance of returning an otherwise able member of society to his work and thereby relieving him and his dependents from the necessity of public support; (3) the manifest need for training of students and the greater opportunity for perfection of technique that is obtained by contact of the surgeon and the teacher with much larger numbers of physically afflicted than could ever be afforded by the necessary limitations of private practice. Be this as it may, there are large communities which are not blessed with or afflicted by (the term depending upon the point of view) such eleemosynary institutions as free infirmaries, owing to the class of inhabitants and to the objections of their physicians to the pauperization of the community by establishment of free institutions which are not there needed.

The establishment of public hospitals and dispensaries should depend upon the environment: (1) Of most importance being their economic value and relations. If the city be the centre of a manufacturing community where accidents are common, or where many inhabitants are so poorly paid as to be unable to afford even a portion of the ordinary physician's fee, there is some excuse therefor, as the unproductive man may be returned to his work, the load of his support and that of his family lifted from the State, and actual economic charity thereby dispensed, and yet, as M. Uribe y Troncoso remarks, but Americans will not agree with him,

[5] F. Cheney, Boston; L. Webster Fox, Philadelphia; Henry Dickson Bruns, New Orleans; Hanford McKee, Montreal; Ernst Fuchs, Vienna; H. R. Swanzy, Dublin; Julius Fejer, Budapest; A. Maitland Ramsay, Glasgow.

[6] M. Uribe y Troncoso.

"some middle-class people who cannot afford the professor's fee will consult him in the free clinics," but middle classes are fully able to pay the usual oculists' fee, though some of them go to free clinics under false pretences, as is also remarked in my correspondence with Adolf Alt Wicherkiewicz and Da Gama Pinto, and is a notorious practice in some of our large American cities. (2) If there be in the city a body of students who be benefited by the sight, study, and handling of such cases another excuse is thereby granted. (3) Another reasonable excuse is that local physicians, by reason of their contact with large numbers of the afflicted, may increase their knowledge. The latter, however, in many instances is improperly applied, owing to the ambition of self-appointed members of the medical fraternity to style themselves "professor" and thereby in their own opinion elevate their standing in the community and increase their gains by the evident advertisement above that of simple members in the medical fraternity. (This criticism should be practically confined to certain institutions in America.) In some localities, however, there is ample room and a crying need for the establishment of additional professorships and charitable institutions.[7]

The position of the buildings intended for such purposes should be within reasonable walking or cheap transportation distance of the localities in which the poorer classes live and work. This requirement is generally well met.

The architectural design, mechanical detail, and construction of the buildings in which this business is carried on may be inferior, imperfect, insanitary, and never in the first place intended for such purposes. Naturally this is owing to the financial condition of some institutions, they being supported in part by charity, in part by enforced or more or less unwillingly given contributions from members of the staff, and in a few cases by charges to patients. All such institutions should be subsidized by the city, State, or country in which they may be located, as they form important economic items in the body politic.

Here may be interposed the evident abuse of infirmary privileges and the admission without proper evidences of pauperization of patients[8] who are really able to pay a medical fee and who thus deprive the young doctor of the means of livelihood. The ambition for crowded clinics is a basis for this complaint, and it is to be blamed upon the civil authorities as well as the surgeon in charge. Certain institutions try to create a halo of glory by the great number of patients taken care of each year.[9] The cure for this is a certificate showing need of services and inability to pay from a physician.[10]

[7] M. Uribe y Troncoso, Mexico.
[8] Adolf Alt, St. Louis.
[9] A. Sulzer, Paris.
[10] Henry Dickson Bruns, New Orleans.

In order to deliver what is due the patient, whether or not he pays what it is worth or receives the services gratis, the best mentally and physically equipped men in our profession must work in sanitary surroundings with sufficient equipment, and must have properly qualified assistants, in order to enable them to use their brains and thereby their hands for the best advantage of the patients. No new institution of this character should be started without proper financial backing, without proper buildings, complete in mechanical detail and construction, without proper equipment, and without proper lay management as well as medical attendance.

The organization of an eleemosynary institution should be in the hands of those who provide the funds; the power should be in a board of laymen whose business it will be to secure and apply the necessary moneys for the buildings and subsequent care of the institution. The decision of all matters of policy should rest with this lay board. "*Securus judicat orbis.*" The position of the medical man in the running of such an institution should be advisory only.

Time was when hospital directors and trustees shared the awe of the ordinary patient for the physician, and thought that, like the king, the medical man could do no wrong. After experience in organization and in the routine of hospital management it is found that, strange as it may seem, and vehemently as it has been denied, the physician as an officer may be governed by the most petty motives, by jealousy, greed, and envy, and by conceit and lack of sincerity.[11] Self-control and broad-mindedness should be attributes of the specialists in charge, and the door should always be open for personal animosity to go out.[12]

Directors and trustees have learned that the judgments of medical men and their confreres are to be taken *cum grano salis*, and that in any suggestion there are apt to be concealed personal, professional, or tactical motives. Therefore those who provide the funds should say how these institutions should be run. Lay boards of intelligent, capable, and upright business men know the aims and needs of the sick poor as well as physicians, and have no personal jealousies to keep them from attending to these needs in the right way. There should be an advisory medical staff before whom only should be brought up matters connected with sanitation, medical, and surgical therapeutics, and with the appointment of their confreres, assistants, and nursing staff,[13] as in Italy.

It is no exaggeration to say that the numbers of patients appearing daily before our larger institutions for diseases of the eye,

[11] Percy Fridenberg, New York.
[12] Percy Fridenberg, New York. M. Cirincione, Rome.
[13] M. Wicherkiewicz, Cracow.

ear, nose, and throat require staffs of at least double the number that are now serving them. The addition of new clinics, as well as increase of the number of surgeons and even of assistants, would afford relief,[14] but is opposed by those already in position. This is the tendency from time immemorial in close corporations, guilds, and similar bodies in all walks of life.

It is impossible to expect help from within. Protest from the ranks is "mutiny," from equals "perfidy," from laymen "impertinence." Evils are recognized by many on the inside who fear to lose favor with the powers that be if they suggest that there is anything short of perfection in the "best of all possible" institutions. When such is called to their attention the reformer is advised "not to stir up trouble; let somebody else do it; keep quiet; don't be known as a reformer; don't get disliked; or to get out."

Those who suffer the evils, namely, the poor, "have no right" to cry aloud, for they are "getting something for nothing." Those who have the power to abolish them are not aware of the conditions. Therefore, under such circumstances, the correction of such evils not being looked for from within, the authorities should have their attention called to them—as in all large clubs and social institutions—by the complaint box, one for the patients and another for the staff; an officer should be appointed to care for these evils, and to bring any that cannot be immediately corrected to the board of directors.

Some of the evils in the personnel are the inattention to duties of the nominal heads of the staff, the overcrowding of the clinics, the insufficient service, and small number of assistants.

In the dispensary there is frequently only one clerk in a poorly equipped corner who attends to perhaps two or three dozen or a score or so of patients. One or two assistants, not at all experienced in routine, refract 20 or 30 cases or more in the course of an hour. Even skilled oculists in private practice, with the good equipment of their own office, with skilled assistance of a nurse, and what is more important, a frame of mind necessary for the performance of this work, find it impossible to handle a dozen refraction cases in a day.

The assistants in our eye dispensaries have, as a rule, little or no practical training. They have to be trained by those next in rank, their seniors, who are already kept pretty busy with their duties. The result is desultory, imperfect, hurried, and consequently slovenly work, inevitable and not to be laid at the door of the individual unless it be the top rank man.

The head surgeon is really responsible for these evils, whose pride of office and position, or whose selfishness or professional jealousies keep down the number of positions to be filled by men

[14] M. Uribe y Troncoso, Mexico.

of equal rank and hence of supposedly equal capability, who overloads his own clinic, runs up the number of operations performed in his service, and saps his clinical assistants with routine work.

Apropos to this condition may be cited the fact that the pathologist of the staff is so, as a rule, only in name. This should be a paid position, and he should have a properly equipped laboratory in which to work. He should be in attendance at the clinic at its regular sessions, and not put his sole attention upon the mounting of microscopic specimens, but make routine examination of conjunctival secretions as well as pay attention to tumors or other interesting scientific work. A properly paid man should be employed to administer general anesthetics.[15] An official optician is a requirement in very large clinics, but even here it becomes a question whether a rota should be kept and revised frequently of competent and honest opticians, all working to a fair but not exorbitant charge.[16]

The institutional jog-trot now tends to discouragement of initiative and individual enthusiasm in the assistants. Insufficient attention is paid to the refraction work and to the commoner diseases of the eye, and only when some unusual case comes is interest displayed.

Many of the surgeons and assistants are unable to communicate intelligently with patients of foreign nationalities. An interpreter in our larger clinics and hospitals should be as familiar an officer as in the courts.[17] Such a person would have plenty to do and would save much valuable time, besides making it possible to get information, the lack of which in some cases obscures the diagnosis and to a certain extent cripples the treatment and consequent results. He would be of great aid in establishment of communication between the physician and patient, which must be the basis for all effective treatment. By the means of the interpreter clear directions could be given to patients and the time of the chief of staff thereby saved.

The patients themselves could be directly instructed not only individually, but collectively, by placards on the walls, telling them how to bathe the eyes, apply salves, how to take medicines, the teaching of how to avoid spreading eye disease and the first aid to the injured, their dietary and regimen, could be effectively communicated by such wall signs. Printed slips with clear, terse directions could be given with the first bottle, telling just how the contents should be used,[18] but among the ignorant this only does not suffice and the patients must be individually instructed.[19]

[15] Sydney Stephenson, London. A. Maitland Ramsay, Glasgow.
[16] Ibid.
[17] Percy Fridenberg, New York.
[18] Ibid.
[19] A. Sulzer, Paris.

In but few clinics is the clerical work sufficiently accurate. The work could be more advantageously done, not only for the patient, but for ophthalmic science in general, by special clerks to take the case histories. This might be the first position in which the aspiring assistant may be placed, progressing thence to the refraction room, thence to that of clinical assistant, and thence to that of assistant teacher.

We come now to the question of fees for treatment, medication, and appliances. Should or should not the individual "charity" patient be charged some small sum for his medicines, for his glasses, and for his appliances? A few persons apply to public infirmaries and yet retain sufficient self respect not to allow themselves to be wholly pauperized. Where the institution is not fully supported by the State or by some organization a contribution box should be in the waiting room, another in the refraction room, and another at the pharmacy. It is penny-wise-pound-foolish to require these patients to pay anything direct. These institutions should be supported by public and private contributions, not directly by fixed fees to the persons whom they are intended to help. Continental European clinics are in some instances conducted by a professor and supported by the State, the polikliniks by privat docents and supported by benevolent societies.[20] Medicine should be furnished free. A fund should be established for the dispensing of lenses and frames, as well as for apparatus. No gold or gold-filled fittings should be given out. Medicines, glasses, and apparatus should be given in the simplest and cheapest form in which they will do the most good.

In regard to the medicines, eye drops should not be furnished in a corked flask—the eye dropper should be a part of the bottle. Salves should not be given in jars or wooden flasks, they should be in tubes. General medicines should be furnished in new and clean bottles. Certain medicinal foods, as the various infant and malted foods, should be dispensed. A special milkman, iceman, grocer, and butcher should be unofficially connected with the institution, his goods and his prices to be frequently supervised by the authorities. Favoritism of certain tradesmen (as insurance companies in Europe) should not be tolerated.[21]

Stress is now laid on the admission of operative cases to the hospital wards. There is a craze for cataracts, despite the small proportion of these cases in America, where the climate and methods of life are not conducive to this affection, and where it furnishes but a modicum of the operative cases. There is always room for one more operative case in the hospital, but rarely for those requiring constitutional treatment. It stands to reason that some serious affections, such as acute iritis, can be taken care of in the

[20] Julius Fejer, Budapest.

[21] A Sulzer, Paris.

out-patient department. The cases most in need of bedside attention are serious accidents or those in which the eye affection requires constant rest in bed, or where severe constitutional disease effects the ocular disturbances. In the first category we have penetrating injuries of the eyes; in fact, all serious injuries in which there is a possibility of preserving the organ with useful vision. Exceptions should be made, however, in those eyes which are beyond all hope of recovery, and can just as well be attended to at the patient's house until they are in condition for enucleation. Acute glaucoma, cataract, and other serious affections demanding operation, and especially those for which a general anesthetic is needed, are, of course, hospital cases. The medical cases which need hospital treatment, as distinguished from operative, are those with accompanying cardiac, vascular, renal, or gastro-intestinal diseases with other complications. These are the ones which are now denied hospital admission, treated with some placebo, and kept on the go to the clinic week after week instead of being placed under observation and systematic, thorough treatment.

No undergraduate nurses should be employed in an eye hospital. They should be selected from capable graduates of general hospitals and be above the mental calibre of the ordinary servant girl, to which class so many of the applicants for the position of nurse belong. They should receive ward training and instruction in the clinics in the ordinary methods of eye treatment and special procedures. This is only done in a slipshod manner in most institutions. The lectures delivered to the nurses are likewise, as a rule, only of the most perfunctory character, although notable exceptions may be found in some of the larger ophthalmic institutions. The present discipline of the nurses does not leave much to be desired; it all depends upon the class from which they are taken and upon the wise rulings of a capable superintendent.

The house staff should be selected from the graduate students who have completed courses of lectures. No undergraduates in medicine should assist at clinics, prescribe medicines or lenses, do operations or refraction work, or under any circumstances give instruction in a post-graduate hospital. In some countries[22] the small recompense held out to medical men on account of poverty of the inhabitants renders it difficult to get first class men as assistants and then too the hide-bound and medieval character of the people does not permit proper social position of the medical profession. Trouble also develops from these characteristics in the management of hospitals and eleemosynary and teaching institutions.[23]

The course of training for special work should not only include ophthalmic operations and treatment of hospital cases, but should

[22] Da Gama Pinto, Lisbon. [23] Ibid.

pay particular attention to refraction work, diagnostic methods, such as bacteriological examination of secretions, recognition of tubercle, diphtheria, of foreign bodies by the *x*-rays, and a working knowledge of the methods of localization. The pathology of the eye, immunization theories, and the principles of animal experiments, at least to the extent for which they are required for diagnosis, as in inoculation of supposed tuberculosis and the study of microörganisms. The principles of electrical treatment are not taught in a satisfactory manner in any of our institutions. Most undergraduates are as unfamiliar with electricity as is the high school student. The practical application of faradism, galvanism, and the high frequency currents is a blank page to them. Hydrotherapy and hot air treatment is sadly neglected.

The equipment of some eye hospitals and infirmaries is certainly not what should be expected. In the clinics even the test lens cases are incomplete, being used on different days by the staffs of various clinics, and are often dirty and in disorder. They should be kept arranged by the nurse, cleaned by phenol solutions or alcohol,[24] and the trial frames sterilized and some system of supervision exercised.

Diagnostic apparatus should be of the latest model instead of, as is often the case, being old or in bad repair. The test cards and types are frequently dirty and no attention is paid to proper lighting. This is readily obviated by using transilluminated opaque glass test charts. The treatment cases used at the clinics are seldom in good condition; the medicines in the bottles are not renewed until they have been used up; the droppers are used from one patient to another, offering ample opportunity for infection, particularly of trachoma. Sterilization of instruments, eye droppers, etc., is essential.[25] The same may be said of utensils, such as jars, which are passed from one patient to another without proper sterilization. Segregation of the infective cases, as conjunctivitis, ulcer of the cornea, panophthalmitis, and trachoma, should be made in special rooms or wards, and in larger institutions a children's ward is essential.[26] In these rooms special applications and instruments should be kept.

Almost all institutions having clinics for the treatment of special forms of disease, advertise instruction to practitioners of medicine in the corresponding specialties. These courses are supposed to be limited to graduates in medicine. In a few of these institutions this instruction is not at all in accordance with the prospectus and advertisement, neither in the help offered to prospective students nor by the promises given in return for the fees; these promises referring as much to the spirit as to the scope and detail of the teaching. Graduates from small colleges in other cities, many of

[24] M. Wicherkiewicz, Cracow.
[25] Ibid.
[26] Marcel Danis, Brussels.

them practitioners of long standing, come from small towns or rural districts attracted by the names of eminent clinicians and the reputation of skilled operators to learn from them the secret of their success and to acquire under their supervision a little of that excellence to take back to their own patients and apply to their own practice.

Every institution giving post-graduate instruction prints a long list of such luminaries as star attractions of their course. What are the facts of the case? And what do the special students get? Many of the stars, he finds, are connected with other institutions which are mainly or exclusively didactic or pedagogic, and to these the star devotes most or all of his time, neglecting or absolutely denying any duties or responsibilities in the clinical school other than having his name appear in print. Some of them reduce their presence in the hospital to one weekly visit of hardly an hour, and they are penetrated with a deaf hostility to those who give a reasonable part of their time and activity.[27] Others are opposed to the school altogether, but have allowed their names to be printed on the prospectus—as no one objects to being advertised as long as it is done ethically. These teachers shun their clinical students, refuse them admission to their clinics, and forbid their assistants to teach them unless they pay a special fee therefor. The bulk of the teaching, therefore, devolves upon the assistant teachers, many of whom are efficient and ambitious, with enthusiasm for demonstration and a gift for imparting knowledge. They come into closer contact with the post-graduate, as does the tutor at college or the privat docent abroad, and from these men much can be learned. Their disadvantages, however, are many. The routine of clinical work takes up a great deal of their time, and the work of the clinic suffers if they spend much time in teaching. Of course, with adequate assistance both functions could be carried out perfectly well, but this would require a larger staff and new heads of departments, and we have seen where the opposition to this reform is deeply rooted.

Instruction in refraction, diagnosis, pathology, general operative technique, and the details of after-treatment, as well as clinical diseases and special courses in the physiology of vision, could well be given by such assistants, provided that they showed they were fitted for these duties, the surgeons limiting themselves to operative surgery of the eye and clinical ophthalmology. The turning out of poorly trained and hence incompetent oculists by some poor graduate schools is one of the results of slipshod instruction.[28] But in the writer's personal experience such self-styled specialists are premature deliveries of even the best institutions—self-inflicted abortions in fact, caused by systemic disease in the embryo, and

[27] A Sulzer, Paris.

[28] Hiram Woods, Baltimore.

are largely of the class of men who obtain their special education by a few weeks or months of superficial observation of European clinics—some of these aspirants not even having a smattering of the foreign language used by the professor.

An ideal school, in addition to the usual medical and operative courses, would offer instruction in the hygiene of vision, ocular dietetics, prophylaxis of infection, prophylaxis of injury to the eyes, the prevention of blindness, as well as the management, training, occupation, and care of the blind; a study of occupational eye diseases, of eye injuries connected with the various trades, together with visits to the various manufactories and institutions, the examination of machinery where accidents are liable to occur, study of the management of these factories, workshops, and of mine work should be given. The economic question of blindness and its relation to the State, charities, and insurance, might be considered. Instruction of special nature for oculists should be (in addition to diseases and operations) the study of those affections which are the effect of or are necessitated by the environment and general conditions, the study of ophthalmic and optical questions, the use of special apparatus, study of models of optical instruments, investigation of the color sense, and other points in the physiology and pathology of vision. Electrotherapeutics is generally sadly neglected. The specialists in electrotherapeutics have ordinarily a holy terror of the eye, and will not give sufficient dosage to be therapeutically efficient.[29] Each oculist should be well versed in electrotherapeutics and radiology so that he may at least personally direct their application.

The scope of instruction, or rather its object, might be widened to include laymen who devote themselve to work in which diseased eyes and poor vision are factors. Settlement workers, teachers, officials in reformatories and charitable institutions might take such courses to the advantage of those committed to their care.

We hope that the educational value of this article will be considered by the reader to outweigh individual idiosyncrasy and to balance any Utopian ideas that may be herewith promulgated. We recognize, as any fair observer must, what inestimable good is being done, how much is being accomplished, and how much the good outweighs the bad. There is, however, much room for improvement in our eye dispensaries and teaching institutions, and much might be added to the utlimate results and savings. It is with a recognition of these possibilities and of the very evident need of reform in institutions, and with the still more evident possibility of bringing about such reform, that we endeavor to call attention to the sins of omission and commission, and to come nearer the perfection which could be reached were the effort made by those most directly interested.

[29] A. Sulzer, Paris.

THE TREATMENT OF LOCOMOTOR ATAXIA.[1]

By Edward Livingston Hunt, M.D.,
ASSOCIATE CONSULTING NEUROLOGIST, ST. LUKE'S HOSPITAL, NEW YORK.

To outline a definite plan for the treatment of locomotor ataxia is difficult. To lay down hard and fast rules is impracticable. To treat every patient alike is not possible. Conditions are complex and symptoms numerous; in each case there has to be considered the treatment not only of the disease but also of the individual. It is true that the earlier a patient comes under treatment the better will be the results; it is true that the more persistently he remains under treatment the more lasting will be the results; it is true that the more negligent he is of treatment the more disastrous will be the results.

Every case of tabes should have both a physical and laboratory examination. In every case there should be made an ophthalmoscopic examination; in every case there should be made a Wassermann test. In ordering a Wassermann test it should always be remembered that if the blood is taken too soon after the administration of either mercury or arsenic the result will be valueless. Mercury and arsenic for a period of twelve weeks after their administration render the Wassermann test negative.

Locomotor ataxia is a parasyphilitic disease. In its treatment, therefore, it is of importance to weigh the value of salvarsan and mercury. Salvarsan does little good; instances have been reported where its administration has aided, but these cases have been few and early. Nonne thinks that its administration has, for a time at least, relieved some of the symptoms. There has been no real definite proof that in locomotor ataxia any marked or permanent help has followed the use of salvarsan. Such good as has resulted has been of a transient nature, and decidedly questionable. On the other hand, instances have been chronicled where its use has inaugurated an optic neuritis and hastened an optic atrophy. It should not be given if arsenic has been recently administered.

Mercury is of benefit. To my mind its use is indicated in every disease where the etiology has been proved to be syphilitic. In tabes the contraindications to its use are a beginning optic-nerve atrophy, well advanced cases, dyspeptic and anemic cases, and those which show an intolerance or those which have had a great deal of mercury. It is best administered by the hypodermic method, the next best method is by inunction, and the poorest way to administer mercury is by the mouth. The fundus should be examined; if there is any indication of an involvement of the optic nerve neither salvarsan nor mercury should be given.

[1] Read before the Medical Society of the State of New York, April 16, 1912, at Albany, N. Y.

The question as to whether or not the patient is in need of mercurial treatment is one difficult to decide. The best guides are the general condition of the patient, the index afforded by the Wassermann test, and the clinical evidence as to whether or not the tabetic process is arrested.

The treatment of the seat of the disease consists of such measures as may be directed toward improving the local nutrition of the cord. These consist (1) of counterirritation, as galvanism, hot and cold applications, and especially the cautery; (2) of measures directed toward stretching the cord. Formerly this was accomplished by having these patients hang from a parallel bar, but more recently there has been adopted a safer and more reliable method, namely, that of flexing the trunk upon the extended legs while the patient is on the floor in a sitting posture.

The treatment of the symptoms can best be considered in the order of their importance and frequency. The first, the most common, and the most distressing symptom of tabes is the pain. It occurs in 88 per cent. of the cases. First, simple external remedies should be tried, such as hot-water bags, the application of sand bags, ironing, ices, iodine, mustard, and plunging the leg in alternating hot and cold baths. Dry cups, the cautery, chloroform liniment, firm bandaging, vibration, massage, and faradization can and should be tried. If in spite of these remedies the pains still persist or tend to become worse the patient should be put to bed and resort had to internal remedies. For this purpose a host of drugs have been employed. One may choose from aspirin, antikamnia, pyramidon, antipyrin, codeine, salpyrin, and even sodium salicylate. A French method, which consists of injecting a week solution of cocaine into the subarachnoid space should also be mentioned. It is neither practical nor free from danger. Finally, there is the hypodermic of morphine. This should only be given by a physician, and then as a last resort. If, however, nothing else relieves the patient it should be given unhesitatingly. It is a curious, but nonetheless true, fact that the particular remedy which will at one time relieve the attack of pain will at another time utterly fail. Rest is a powerful aid, and these patients are greatly benefited by prolonged periods of rest in bed and by nourishing food.

The second most common symptom of tabes is disturbances of the bladder. These occur in 80 per cent. of the cases. Here there are few drugs which can aid us. Strychnine to give tone to the bladder wall, ergot, and urotropin if cystitis has developed. Much can be done, however, by careful attention to the bladder. The patient should be taught to empty the bladder at fixed and frequent intervals, and, if necessary, bladder washings given. The catheter should be kept as a last resort. The passing of sounds, faradizations to the perineum, and even the stimulating of the urethra by local

applications of nitrate of silver sometimes help. This aid may only be of a psychic nature, but nonetheless I have seen it help, and consider it justifiable.

Ataxia of the legs occurs in 75 per cent. of cases. Here treatment gives brilliant results. The patient can be taught the Fraenkel exercises. These consist of a series of mild gymnastics, performed at first in bed, later when standing, and finally when walking. The object is to reëducate the legs: first to stand, next to step, and then to walk. The patient should do these exercises without the aid of a stick or his eyes. Persistency is required; a daily course of these exercises should be followed for fifteen minutes in the morning and again in the afternoon. The physician should carefully observe the patient, as the latter is apt to overdo and tire himself. The tabetic is in no way capable of judging of his own capacity, a point which cannot be too strongly emphasized. The Fraenkel exercises are numerous, but space is lacking to go into them here in detail. These exercises can also be applied to the hands; precise and delicate motions can be practised, which will give very remarkable results.

It is important that these patients learn to walk without the aid of their eyes. Let me emphasize that women tabetics are troubled very little with ataxia. This may be due to their skirts. Also that those ataxia cases which become blind, invariably improve in so far as their walking is concerned. These two instances call our attention to the importance of having the ataxia patient walk with his legs and not with his eyes.

The diminution of the sexual desire is unfortunately beyond the aid of the medical man. Tonics and aphrodisiacs can be tried, but usually accomplish but little. Damiana, strychnine, and yohimbin give the best results, but even they prove unavailing.

Perforating ulcer of the foot is an unusual complication. It occurs in 5 per cent. of the cases. The treatment is rest in bed, protection in the form of a local application, and finally stretching of the posterior tibial nerve.

The ocular palsies, involving the second, third, and sixth nerves, occur in about 10 per cent. of the cases. The treatment of these is unsatisfactory. For the diplopia a shaded glass can be worn. I have a patient who suffers from this condition, and to do away with it wears a pair of eyeglasses in one of which the glass is opaque. In cases where there is sixth-nerve paralysis, resort can be had to constant exercises, consisting of training and reëducating those muscles.

Ptosis is always a distressing symptom. It fortunately is not of common occurrence, and frequently yields to antisyphilitic remedies. If permanent, surgical measures may have to be considered. A tuck can be taken which will keep the lid up, but will, of course, not affect the accompanying double vision. Electricity here is of no use.

The treatment for the optic neuritis and for optic nerve atrophy has so far proved unavailing. Strychnine in daily doses may delay the atrophy. Mercury should be stopped.

The joint deformities are difficult to treat. Mechanical appliances sometimes aid, but even amputation may have to be considered. These joint complications, however, do best if let alone.

The crises which occur in tabes are varied and numerous. Contrary to general opinion, they are of unusual occurrence, as one meets with a crisis in only about 6 per cent. of the cases. They are best classified in accordance with the several viscera. The most important for the therapeutist and the one which is most commonly encountered is the gastric crisis. The treatment of the gastric crisis is either medical or surgical. Medical treatment is the least radical and the most practical. The most serviceable drugs are cerium oxalate in 5-grain doses every half-hour, minute doses of strychnine, antipyrin in frequent and small doses, chloral hydrate, cannabis indica, and some of the alkaloids of opium, as codein and dionin. Powdered opium itself can be administered, first in the form of suppositories and later hypodermically. Methylene blue in 1-grain doses has been tried. Oppenheim speaks of injections of cocaine into the epidural and subarachnoid spaces of the spinal canal. Levy and Pope have added to these injections alcohol and stovain. Simple lumbar puncture has been done with but scant results. These latter methods are, however, far too radical and far too impractical to warrant serious consideration in every-day practice. A patient who is subject to gastric crises should have a series of simple and harmless remedies, which he can use when the crisis occurs. If, after repeated attempts there is no abatement, hypodermics of morphine are indicated and should unhesitatingly be given. The hypodermic of morphine should only be given when all reasonable remedies have failed and when the patient has reached a point where decided inroads are being made upon his reserve strength and vitality. This means that every effort should be put forth between the attacks to build up the patient and to feed him so that he will be prepared and ready to withstand an attack of vomiting. It is this intercurrent treatment which is the keynote of the treatment of the gastric crisis.

The surgical treatment, which consists of dividing the posterior nerve roots, has been recently written of and tried by some. Personally I have had no experience with it, and except as a last resort should hardly be inclined to advocate it. A patient with tabes is to my mind not a fit subject for a serious operation, provided that such operation can be avoided.

The laryngeal crises can best be helped by sprays of menthol, and as a last resort cocaine.

The rectal crises can be relieved by suppositories and fomenta-

tions. The crises of the other viscera have to be met by the administration of many and varied local remedies as well as by opium. In tabes morphine is a powerful, but a dangerous aid—one to be used with great judgment, but in supreme moments with no hesitation.

The treatment of the mental condition of the patient is important. The tabetic is peculiarly susceptible to suggestion, and is constantly seeking new remedies and outside aid. His condition is ever before him. He is sensitive, easily depressed, and easily exhilirated. Hope springs eternal—undoubtedly a wise provision of nature, and one which should be encouraged. A change of treatment, a new remedy, a new suggestion, however trivial, will often start one of these unfortunates upon a new lease of life. The physician should bear this in mind and never relax in his efforts to make new suggestions and to stimulate hope.

The treatment of the physical condition of the tabetic is all important. The disease is characterized by sudden and unexpected crises and exacerbations. Constant efforts should therefore be made to improve the general health and to fortify the strength. A reserve of energy and force is of great value. The degree of anemia, the blood pressure, and the weight should be closely watched. A tabetic who loses weight is not doing well; a tabetic who gains weight is doing well. A simple but nutritious diet helps; one abounding in fats helps more. Cream, butter, bacon, marrow, and oils are indicated. Baths aid, warm baths especially. They serve to quiet these patients, to relieve the pain, and to improve the general nutrition. Carbonic acid baths are of service. Spinal douches, if not too violent, are useful. General tonics—iron, strychnine, and especially arsenic—are from time to time of great value. If much emaciated, cod-liver oil is indicated; and if the stomach is disturbed, nux vomica may be useful. Constant and unremitting attention must be given to the bowels. One of the great horrors of the disease is the obstinate constipation. Laxatives, plenty of fluids, fruits, and enemas must be used.

So far as climate is concerned, the tabetic does better in summer than winter, and therefore in a warm, dry atmosphere. These patients move about with so great difficulty that few if any obtain sufficient air, a factor which is not sufficiently recognized and one which is of great importance. A change of environment will often prove beneficial. A month spent at Lamalou les Bains in France is very helpful.

Rest is a wonderful aid. Many of these sufferers fail to do well under every condition, but let them spend two or three days in bed and the improvement is remarkable. Rest in bed aids them physically and aids them mentally. Massage is serviceable to them, especially at the beginning. They should be constantly cautioned against physical strains and exhausting effort.

Finally, the treatment of tabes is one in which there should be constant supervision. The greatest attention should be devoted to details. Drugs should be used as sparingly as possible. Air, rest, hydrotherapy, and fattening food should be tried, while the physician should adopt a never-failing attitude of hope and encouragement.

TUBERCULIN THERAPY IN SURGICAL TUBERCULOSIS.

By Thomas Wood Hastings, M.D.,

PROFESSOR OF CLINICAL PATHOLOGY IN THE CORNELL UNIVERSITY MEDICAL COLLEGE, NEW YORK.

(Concluded from page 270, August, 1912.)

PART V. TUBERCULIN CONTROLLED BY OPSONIC INDEX.

Control by Opsonic Index. Wright[102] (1910) still claims that the opsonic index is of value in diagnosis, and for guidance in dosage in a certain class of cases. On the following pages of the same number of the *Lancet* (page 885) there is recorded a lengthy discussion by Latham, Hewlett, Walters, Warner, and Lawson, and, with the exception of Lawson and Wright, all conclude that a careful observation of clinical symptoms is more valuable than studies of the blood serum for a guide to dosage. Latham[34] and Leishman[103] believe that clinical observation forms a good guide for vaccine therapy.

Management of Dosage. A dose of vaccine followed in twenty-four hours by a rise in temperature, or increase in fluctuation of temperature, or by exacerbation of symptoms, is too large. A dose producing no effect upon the temperature, and no change upon the symptoms, is too small. The proper dose is one which either lowers the temperature or is followed by a diminution in the fluctuation of temperature, and by improvement in the symptoms; and when the effect of the proper dose becomes less, the dose should be increased; but the dose which gives good results should be repeated. These rules apply also to tuberculin therapy.

Inman[98] states that it is essentially an individual treatment. There are three guides: (1) The general condition of the patient; symptoms, physical signs; (2) the temperature curve; (3) investigation of the serum. Each is valuable, but together each is more valuable.

Emery[35] states that the opsonic index affords no clue to the antibodies formed, and that the same benefits may be obtained by simpler methods. Control by the opsonic index, or any other method of serum examination seems unnecessary. Wright's[102]

results show that the length of treatment varied from two to thirty-nine months, a variation similar to that recorded by Sahli, Denys, Trudeau, who have controlled cases for years by careful

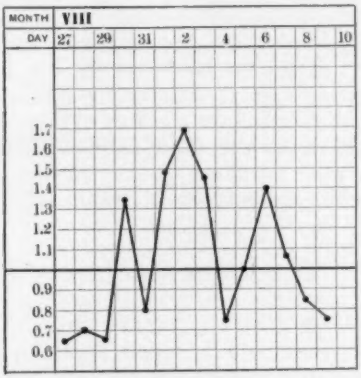

FIG. 5.—Opsonic index to tubercle bacillus. Incipient pulmonary tuberculosis.

observation of the clinical signs and symptoms. Such variations are so dependent upon the individual response at one time and another, and the opsonic index is so fluctuating in an individual

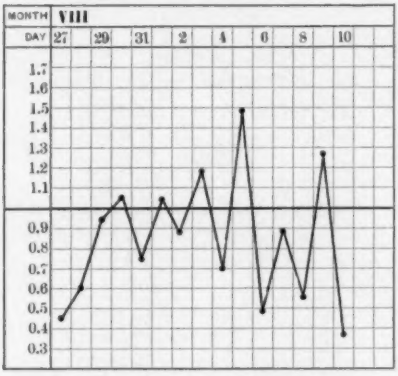

FIG. 6.—Opsonic index to tubercle bacillus. Case of advanced pulmonary tuberculosis.

invaded with tubercle (Figs. 5 and 6), as shown by Reyn and Kjer-Petersen,[104] Hastings,[105] and van der Weij,[106] and many others, that injections should be given *regardless of the index*,

provided the patient shows immediate tolerance and subsequent improvement (Fig. 7).

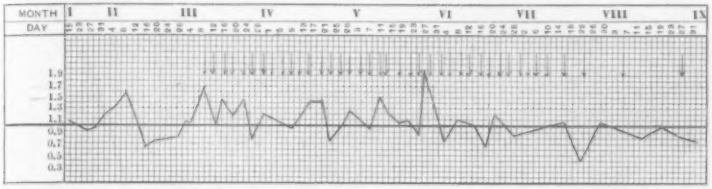

FIG. 7.—Opsonic index to tubercle bacillus. Cervical adenitis, tuberculous.

PART VI. RECORDS OF INOCULATIONS.

The use of tuberculin for surgical cases is of later development than for pulmonary cases. Among the first reports are those of Petruschky[4] (1904), von Hippel,[107] Dörschlag,[108] Nourney,[109] Denys,[12] Heermann,[110] Wright,[58] Bulloch,[111] Kraemer,[112] Walker,[113] Köhler and Lenzmann,[114] and Birnbaum.[115] Wright[58] has recently given a table relating to surgical cases; but his experience does not equal that of Nathan Raw,[116] who is probably handling with tuberculin more cases of tuberculosis, pulmonary, and surgical, than any one other individual, and has had experience with gland, genito-urinary, peritoneal, bone, and pelvic (gynecological) infections.

SURGICAL. One finds scattered throughout the literature on pulmonary invasion isolated instances of a few case reports on surgical conditions (Petruschky, Denys, Klebs, Barney, Pottenger), and a few articles have appeared recently in this country by Hartwell and Streeter,[117] Thomas,[118] Winslow,[119] Peter,[120] Clark,[121] and Pottenger.[122]

This report covers the study in detail of over 174 cases. The cases are grouped according to the anatomical focus invaded as follows: (1) Larynx, 4 cases, 1 death; (2) glands (adenitis), cervical, 43; iliac, 2; 45 cases, 3 deaths; (3) eye and adnexa, 9 cases; (4) tongue (glossal), 1 case (with advanced pulmonary and cervical gland tuberculosis), 1 death; (5) skin (lupus), 3 cases; (6) bones and joints, orthopedic, 65 cases; (7) peritoneum, peritonitis, 5 cases, 2 deaths; (8) intestine, intestinal, 2 cases, 1 death; rectal, 4 cases; (9) adrenal glands, Addison's disease, 5 cases, 5 deaths; (10) genito-urinary tract, 31 cases, 1 death.

A summary of the above shows a total of 174 cases, 13 deaths; 6 cases with pulmonary involvement, 1 renal case with no involvement other than in genito-urinary tract, 5 cases of Addison's disease, and 1 case of general tuberculous adenitis.

LARYNGEAL. Tuberculosis of the larynx is classed, as a rule, under the respiratory and pulmonary invasion, and favorable reports have been made by Jurasz,[123] Pottenger[122] and Winslow.[119]

We have recorded 4 "open"* cases, 3 of them complicating some other form of surgical tuberculosis, and improvement has been noted in all lesions in such cases. The total of cases to date treated or now under treatment is 7, and of these 1 only has died. Three cases which have been under treatment less than one year are not included in this report.

GLANDULAR. Results for gland invasion, in a small number of cases, were reported by Petruschky[4] in 1904, and Wright[58] in 1905. Denys,[12] in 1905, recorded and pictured the results of B. F. in the service of Sluyts, who treated 20 cases with tuberculin and by minor surgical methods, resulting in 20 cures which were slow in their course, but without radical operation.

Inoperable adenitis, "open" or "closed," responds readily to injections but a cure may require three years. Our cases are 45, 42 postoperative; 43 cervical, 2 with mediastinal and 2 with axillary involvement; 33 "closed" postoperative; 3 "closed," no operation; 7 "open" postoperative, and 2 inguinal "closed" postoperative.

Of the 43 cervical, 3 were complicated with renal or cystic or other genito-urinary involvement; 5 with pulmonary (2 deaths); 6 with ophthalmic involvement; 1 case died six weeks after cessation of treatment with symptoms of brain tumor and finally, of cerebral hemorrhage. Total deaths, 3.

In 2 cases, only possible recrudescences of the infection were noted, in 1 in the spine and in another possibly in the brain as a solitary tubercle. Abstracts of the histories of these 2 cases are inserted here.

CASE I.—Marjorie K., aged two years. Tuberculous cervical adenitis, two and one-half months duration; suppuration; two operations, with little improvement; temperature variable, usually three days out of the week to 102.5° F. in the late afternoon. Inoculations from February 19, 1910, to September 1, 1910 (six and one-quarter months); 30 inoculations; mixed vaccine, Micrococcus aureus and pneumococcus from May 10 to September 1, 1910 (19 inoculations); reported upon one year after apparent cure; recrudescence of tuberculous disease in spine.

One month after an attack of influenza, November, 1909, in Florence, the cervical glands in the right side began to enlarge. Operated upon in England, December 24, 1909. Profuse suppuration of wound continued and on January 20, a more thorough operation was done on right neck. Two open wounds persisted.

February 18, 1910. Adenoids and tonsils removed. Cultures from cervical wounds sterile.

* For explanation of terms "open" and "closed" see page 262

Tuberculin injections begun February 19, 1910 (0.1 c.c. of 0.0000001); weight, 30¼ pounds.

March 8. Weight, 28½ pounds. Otitis media left.

March 22. Micrococcus aureus from wound and left ear.

April 8. Nares and ears treated for infection. Conjunctivitis right eye, autogenous Micrococcus aureus vaccine (50,000,000).

April 20. Purulent conjunctivitis both eyes.

April 27. Weight, 29 pounds; temperature to 105° F., and a second acute middle ear infection. In cultures Micrococcus aureus and pneumococcus were found and a mixed vaccine was prepared. Tuberculin had been continued. Wounds healing.

May 15. Fifteenth inoculation (0.4 of 0.000001) of tuberculin. Mixed vaccine 25,000,000 pneumococcus, 75,000,000 Micrococcus aureus. Condition excellent.

May 25. Conjunctivitis recurred in both eyes.

June 11. Tuberculin injections had increased to 0.1 of 0.00001. Weight, 31 pounds. Tuberculin injections continued; vaccine injections discontinued. Patient removed to the country.

September 1. Condition excellent, apparently cured, and injections of tuberculin discontinued.

December 1. No recurrence in the glands and general health excellent. Seven months after last tuberculin injection symptoms of invasion of the spine and two months later Pott's disease well established.

Case II.—Dr. W., aged thirty-eight years. Tuberculous adenitis, cervical, submental, axillary, mediastinal (?). Four years before coming under observation, right and left cervical glands enlarged, following an attack of tonsillitis; radical operations in May, 1906, and October, 1906; several minor operations up to and during 1908; improvement after surgical intervention temporary; hygienic treatment from 1906 to 1908; temperature quite regularly to 101° F. in the late afternoon. Tuberculin inoculations December 16, 1907, to August 19, 1908; from September 21, 1908, to December 14, 1908; from January 30, 1909, to August 17, 1909; from December 15, 1909, to January 30, 1911 (90 inoculations). Tetanus antitoxin August 19, 1908, serum-disease. Autogenous Micrococcus aureus vaccine from March 31, 1908, to May 26, 1908; from November 7, 1908, to August 2, 1909 (47 inoculations), under observation 3½ months after last tuberculin inoculation January 30, 1911; under good hygienic surroundings from 1906 to 1911; death sudden following symptoms of brain tumor May 14, 1911; autopsy not permitted.

In 1903 there developed cervical bilateral adenitis following tonsillitis. Operation May, 1906, in the left posterior triangle and left axilla. Left cervical area was filled with purulent tissue and was curetted. Tubercle bacilli were found. Complete removal was impossible. In October, 1906, submental region left to right

and right cervical tissues were removed. "Recurrences" found later when wound dressings were removed, and right axilla was found involved. From June, 1907, to December, 1907, was at Saranac Lake. Previously had been living in Pittsfield, Massachusetts, and now resides there, undergoing the regular tuberculosis cure. Inoculations were begun December 16, 1907 (0.1 c.c. of 0.000001) at three or four day intervals.

January 8, 1908. Right neck opened and curetted.

January 15. Right neck again curetted; no inoculations were given for ten days after operation.

February 14. Marked improvement since January 26, and was given 0.5 c.c. of 0.000001. Slight general reactions followed the inoculations from December 16, 1907, to February 1, 1908.

April 14. Micrococcus aureus was isolated from cervical wound and an autogenous vaccine prepared and 200,000,000 to 400,000,000 given at five-day intervals. Tuberculin continued at three to four-day intervals (0.1 c.c. of 0.000005).

April 26. Marked general reaction after 0.2 c.c. of 0.000005.

July 11. Dosage reached 0.2 c.c. of 0.00001.

August 25. No tuberculin given until September 25, on account of "serum krankheit" following tetanus antitoxin on August 19.

September 21. Inoculations resumed (0.2 c.c. of 0.00001).

December 14. Episcleritis from Micrococcus aureus vaccine. Dosage reached 0.5 c.c. of 0.00001. No tuberculin or vaccine until January 30, 1909.

January 30, 1909. Weight, 160 pounds, a gain of 12 pounds. Wounds in left neck still discharging but much smaller. Inoculation of tuberculin 0.2 c.c. of 0.00001; micrococcus vaccine, 370,000,000.

April 27. Last vaccine April 27. Episcleritis recurred and promptly cleared up after withdrawal of vaccine.

June 20. Tuberculin omitted for two injections on account of possible "hypersensitiveness" (eyes). No improvement in episcleritis noted.

August 2. Vaccine stopped and episcleritis cleared in ten days. Pain in eyes twenty-four hours after Micrococcus aureus vaccine. Tuberculin reached 0.3 c.c. of 0.00005.

August 17. Weight, 166 pounds, a gain of 18 pounds. Tuberculin withdrawn. Sinus nearly closed.

November 19. Weight, 156 pounds. A loss of 10 pounds. Evening rise in temperature during last ten days, and asthenia. No tuberculin since August 17.

December 18. Tuberculin injections (0.1 c.c. of 0.0000001) again begun. Acquired immunity lasted three and one-half months.

December 24. After two tuberculin injections regained energy. Weight, 157 pounds.

1910. From January to March dosage increased to 0.4 c.c. of 0.000001, and gain in weight, 162 pounds, and marked improvement noted.

August 30. Weight, 173½ pounds. After an injection of 0.5 c.c. of 0.00005 a local reaction occurred.

October 10. In excellent health, weight, 175½ pounds, a gain of 27½ pounds. Given 0.8 c.c. of 0.00005 at intervals of ten days. Wound healed. Axillary glands small.

November 20. Given 0.5 c.c. of 0.0001; apparently well. Weight, 182 pounds, a gain of 34 pounds.

Last injection (0.5 c.c. of 0.0001) January 30, 1911. Five months after last injection of tuberculin indefinite symptoms suggesting cerebral involvement. At an interval of one week two attacks with headache, projectile vomiting, then apparent recovery. At the end of fourth week a similar attack with disturbance of vision, with apparent recovery at the end of ten days. No symptoms and general health good for three days then a sudden attack with explosive vomiting, slight headache, beginning optic neuritis, in both eyes (?) and death at the end of twelve hours with symptoms of cerebral hemorrhage (?).

Two full series of injections were given over a period of three and one-half years. The second series included injections of an autogenous Micrococcus aureus vaccine and of tuberculin.

Case III.—Thomas C., aged thirty-seven years. Tuberculous adenitis, cervical, fifteen years' duration. The abstract of a third history is interesting mainly from the fact that recurrence appeared within six weeks from cessation of the tuberculin, and that recovery was complete, though slow, after an operation more radical than the two which had previously been performed.

Four and one-half years ago radical operation, right cervical region; seven months ago radical operation, left cervical region; recurrence in right lower anterior triangle of neck; temperature variable, with slight rise to 101° F. in the late afternoon; no complications, hygienic treatment thorough; advised against third operation. Tuberculin inoculations from April 30, 1907, to December 13, 1907 (34 inoculations).

December 15. A large tender lymph gland noted in the left axilla.

May 28. No tuberculin since May 13, enlarged gland in left axilla persists; no recurrence in the cervical regions.

June 20. Went abroad; operation on both axilla.

Cervical glands on the right side were noted enlarged in 1892; apparently quiescent until the fall of 1902, when they rapidly enlarged and a radical operation was done, the right cervical tissues from the parotid to the clavicle being removed. In October, 1906, the left cervical tissues were removed in the same manner.

April 25, 1907. Recurrence noted in the last few months on the right side, none on the left side; general condition is good; weight, 166 pounds, 11 pounds more than normal. Patient has recently been examined at Saranac Lake; fresh air, limitation of work, and tuberculin advised. Operation advised against by competent surgeons.

April 30. Patient was advised to construct a sleeping shack on the roof. Tuberculin inoculations begun, 0.2 c.c. of 0.000001; inoculations given twice a week, and gradually increased until September 14.

September 21. Inoculations had increased to 0.2 c.c. of 0.0001, interval between inoculations lengthened to one week. For the first time in several months the angle of the right jaw can be felt.

September 28. Following the inoculation of 0.3 c.c. of 0.0001 a moderate general reaction.

October 20. A moderate general reaction following 0.4 c.c. of 0.0001.

October 26. Enlarged gland noted in the left axilla, not tender. Following the reaction on October 20; dosage reduced to 0.3 c.c. of 0.00001.

November 26. Gland in left axilla decreased in size, slightly tender; patient feels much improved.

December 15. Forty-eight hours after 0.5 c.c. of 0.00001, the gland in the left axilla, was more painful and more tender, and the periglandular tissues considerably swollen; no constitutional symptoms; loss in weight of 13 pounds.

December 22. General condition much improved; patient has received no tuberculin since December 13; axillary glands much swollen. The pain and tenderness in the left side explained by the sudden appearance of a well-distributed herpes zoster.

May 28, 1908. The glands in the left axilla are still enlarged. No recurrence in the neck, and no tuberculin since December 13, 1907.

June 20. The patient went to Europe.

October. Temperature returned, and he was ill before landing on the Continent (axillary glands). Went to Austrian Tyrol, and there was in the hands of a sanitarium expert, who advised treatment with Beraneck's tuberculin. Did not accept advice, but went to Kocher, in Bern, who performed a most radical operation in the axillary region; febrile illness lasted several weeks; able to return home in the late summer, and has continued the out-door treatment and roof sleeping.

EYE AND ITS ADNEXA. For tuberculosis of the eye and its adnexa, tuberculin was used by von Hippel[107] and by Dörschlag[108] prior to 1905. An excellent experimental study of such cases was made by Daels[27] in 1907, and articles dealing with the clinical results have come from Snell,[124] Brueckner,[125] Bull,[126] Darier,[127] Dor,[128]

Derby,[129] and Herrenschwand,[130] all of whom agree as to the beneficial results from tuberculin.

SUMMARY.—Of our 9 "closed" cases, the outcome is unknown in 3, the process was arrested in 1, and 5 were cured.

TUBERCULOSIS OF THE TONGUE. We have treated one "open" case, which was complicated with the presence of pulmonary invasion, and involvement of the cervical glands. Death occurred from pulmonary hemorrhage. The condition of the tongue was markedly improved after three months' treatment.

SKIN TUBERCULOSIS, INCLUDING LUPUS. Nourney[109] (1905) and Heermann[110] (1905) reported at the Verein der Aerzte, of Duesseldorf (in 1905), the treatment of a few cases of lupus, with

FIG. 8.—Lupus, after six months' treatment with B. E. and autogenous vaccine.

satisfactory results. Denys[12] states that all lupus cases are benefitted, and a few are completely cured with B. F., and emphasizes the necessity for considering carefully the specific treatment of the secondary streptococcus infections. Wright,[58] Raw,[37] Tod and Western,[131] and Rosenbach,[132] report good results.

The Finnish, Dutch, and Danish reports are not in accord, and are mainly against those of the other observers.

Our cases total 3 "open" and for these the results may be expressed as poor (see Figs. 8, 9 and 10). The 2 cases photographed were also treated with Micrococcus aureus and streptococcus vaccines (autogenous).

ORTHOPEDIC. Bone and Joints. Denys[12] records 6 cases of bone tuberculosis treated by Sluyts and von der Bergh, with or

without minor operations as seemed necessary, who considered the cases rapidly cured.

FIG. 9.—Lupus. At beginning of treatment.

FIG. 10.—After six months' treatment.

The secondary streptococcus invasion was found an extremely important factor and, as is well known, retarded healing.

Ridlon[133] (1908) reported on chronic joint cases and Nutt and Hastings[134] after experience with 24 cases of bone and joint infections concluded that tuberculin is of decided value in the treatment of tuberculous joints and bones. It seems the best tonic we have for such patients and has also an effect on the local infection, which cannot be wholly accounted for by improvement in general health. This conclusion remains unchanged after careful study of 65 cases. These cases were "open," with sinuses.

PERITONITIS, TUBERCULOUS. Denys[12] reported 8 cases in 1902, and 8 additional in 1905. Of the 16 cases, 13 were classed as cured, and of the 3 deaths 1 was from acute pneumonitis. Birnbaum[115] reported (1907) 11 cases; 5 with, and 6 without ascites, and Nathan Raw[116] (1910) reported 19 cures out of 26 cases.

Summary of our cases: Five "closed" cases; results good in 3, death in 2.

The report of the following case is of interest on account of the complications, the continuance of tuberculin inoculations during the febrile period (see Fig. 3), and the single course of tuberculin.

CASE IV.—Nanette T., aged seven years. Tuberculous peritonitis, bilateral pleuritis, bronchopneumonia. Peritonitis noted in November, 1909. Operation in December, 1909; failing since operation; hygienic treatment in the city; irregularly intermittent temperature with wide variations to 104° F., pulse 120 to 140 (see Fig. 3). Respiration, 30 to 40. Tuberculin inoculations begun February 1, 1910, and continued until July 10, 1910 (27 inoculations, from 0.1 c.c. of 0.0000001 to 0.6 c.c. of 0.00001); hygienic conditions good; in New York until May, then in the country; apparently cured in August; health excellent in December, 1910; no recurrence or recrudescence in October, 1911.

December, 1909. Operation.

January 31, 1910. Has been failing since operation. Temperature irregularly intermittent, with wide variations to 104° F.; pulse from 120 to 140; respirations from 30 to 40 a minute.

February 1. First tuberculin inoculation, 0.1 c.c. of 0.0000001; inoculations to be given at intervals of four or five days.

February 12. Right pleuritis, with effusion; heart 5 inches to left of midsternal line.

February 17. Dulness lessened over right back; heart 3½ inches to the left of midsternal line.

March 20. During last ten days bronchopneumonia and pleurisy signs over left axilla and left back below spine of scapula.

April 1. Improvement marked; temperature, 100° to 101° F. in afternoon.

April 4. Inoculation of 0.1 c.c. of 0.000001, and following it a general reaction with temperature to 103° F. Inoculations

continued regardless of temperature, since no signs of local reaction over abdomen were evident.

May 20. General health and local condition excellent. Patient moved to the country.

July 10. Last tuberculin inoculation given (0.6 c.c. of 0.00001).

December 1. Health excellent, remains well. Weight, increased from 48½ pounds to 62½ pounds, partially accounted for by growth.

INTESTINAL. Seven cases were recorded by Denys[12] in 1905. Of these 3 were febrile, and 1 recovered and 2 died. Of the 4 afebrile cases there are 4 cures. We record 2 "open" cases, with 1 death; 1 intestinal, sigmoiditis death; 1 intestinal, upper colon (?), mesenteric glands involved.

In addition, the 4 following cases were treated with marked improvement in general health and ultimately apparent cure; 3 fistula in ano, 1 perineal tissues and rectum.

ADRENAL TUBERCULOSIS (ADDISON'S DISEASE). Treated 5 "closed" cases. No improvement has been noted under tuberculin therapy. The 5 cases died.

FIG. 11.—After tuberculin inoculations. (Ekehorn, Type i.)

GENITO-URINARY. In 1907, Birnbaum[115] reported excellent results in 4 cases of cystitis, 1 with renal involvement.

Denys[12] (1905) alluded to the excellent results to be expected, and records 1 case of cystitis in a young woman cured after injections from March, 1902, to July, 1905.

Wildbolz,[135] Fullerton,[136] Pottenger,[137] Nathan Raw,[116] Young,[138] Gardner,[139] Walker,[140] report cases, and the general conclusion seems to be that benefit accrues from the increase of the general toxin tolerance. Wildbolz could find in 5 tuberculous kidneys little evidence of scaring.

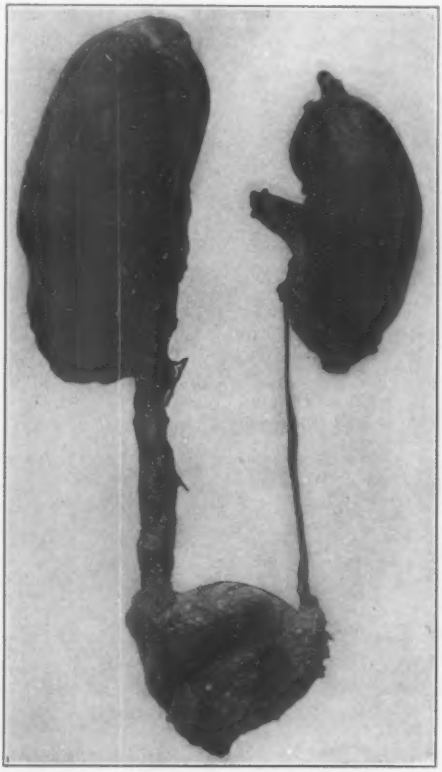

FIG. 12.—Kidney not opened. No tuberculin. No operation. Under observation two years, before death.

Ekehorn[141] recently published an interesting article bearing on the general pathology of renal tuberculosis. It is quoted in detail, for the photographs (Figs. 11, 12 and 13) of 2 of our specimens show his types of lesion. He studied in 33 cases the spontaneous course of the disease, without treatment; 25 died. Of the eight

still living, in whom diagnosis was made eight years ago, on an average, 4 were subjectively healthy, and at times passed a clear urine; but healing was only apparent. In 4 others he states "the process is now rapid and the course will probably be short."

In histological specimens, from section, or late operation, there are two general types of lesion: (1) Kidney changed to cavernous pockets, corresponding to calices, filled with sterile detritus, and parenchyma about all lost (late). (2) The second group is one with a sclerosing process, which involves kidney and surrounding

FIG. 13.—Kidney opened. (Ekehorn, Type ii.)

tissue. At times only a part, as that of the upper third, is involved. Ekehorn concludes that secondary infection from the renal pelvis always follows rupture of the original focus, while the original tubercle-bacillus infection is from the blood.

Since spontaneous healing is a rare exception, nephrectomy is indicated after diagnosis is established. The use of tuberculin is not considered.

SUMMARY OF GENITO-URINARY CASES. With renal involvement: Fifteen "open" cases, with 1 death.

Without renal involvement: Sixteen "open" cases, no deaths. Total of 31 cases, with 1 death. Of 3 untreated cases 2 died, 1 was living in 1910. Thirty-four cases in all were observed over a period of four years with 3 deaths, and a majority of them have improved to such a degree that it is safe to say that at the end of eight years, a period corresponding to that of Ekehorn's observations, a much larger percentage will have survived than noted by Ekehorn for cases running a spontaneous course without treatment. Of the 31 cases treated with tuberculin 22 were considered inoperable, 4 were operated upon after the general health was much improved under tuberculin, and 5 were treated with tuberculin after operation.

In 1 case, a patient, aged sixty years, renal tuberculosis in the left kidney was apparently cured by one series of inoculations over a period of seven months, without operation. The infection in the left kidney was proved by ureteral catheterization.

The abstracts of 3 case histories are appended.

CASE V.—Dr. R. W., aged 42 years. Tuberculosis of right kidney, bladder, prostate, and seminal vesicles. Duration 2 years; inoperable. No hygienic treatment, irregular evening temperature. Tuberculin injections from July 30, 1907, to May 9, 1908 (60 inoculations); improvement. Death two months after withdrawing inoculations.

Tuberculin given in two series: First series, dosage up to 0.5 c.c. of 0.0001; second series, dosage up to 1 c.c. of 0.00002.

CASE VI.—Dr. I. D. K., aged twenty-eight years. Tuberculosis of the kidney and bladder, duration two years.

Tuberculin inoculations from May 21, 1908, to September 22, 1909, and from October 2, 1909, to February 3, 1910 (80 inoculations).

February 19, 1910. Pyelitis. Secondary infection. Nephrectomy.

December, 1911. Occasional attacks of frequency of urination. Urine normal and free from tubercle bacilli.

Tuberculosis of the left kidney and bladder was diagnosticated six months before patient was admitted for tuberculin inoculations. The general health was excellent, and the only symptom complained of was frequent micturition for which the patient consulted a specialist, who through cystoscopic examination discovered the tuberculous condition of the kidney and bladder. The urine contained a relatively small number of pus cells and red blood cells, and a large number of tubercle bacilli. Nephrectomy was advised but the patient refused to have operation, and went to Saranac Lake where he remained for six months, during which time inoculations of tuberculin were administered.

May 21, 1908. The first inoculation of first series was given, dosage 0.1 c.c. of 0.000001 B. E.

May 25. Tubercle bacilli demonstrated in the urine.

August 8. Within twenty-four hours after tuberculin inoculation frequency of urine was increased.

August 2[illegible]. Following tuberculin inoculation on August 22, temperature rose to 101° F., and a general reaction occurred, which lasted two days; one tuberculin inoculation was omitted. Frequency of urination was increased for twelve hours following the inoculation, then suddenly ceased; since August 25; patient states that he never felt better.

September 1. Reported that he was not feeling so well, on account of slight headache and night sweats during the two preceding nights.

September 12. Frequency of urination marked, so that dosage of tuberculin was not increased.

October 3. Frequency of urination diminished, probably in consequence of a few doses of tincture of hyoscyamus.

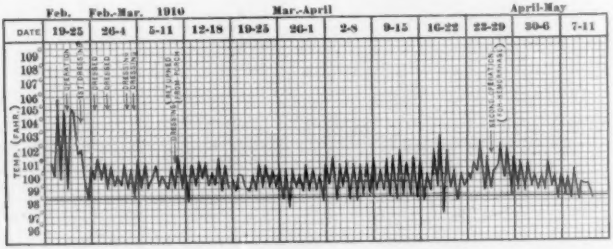

FIG. 14.—Secondary renal infection in renal tuberculosis. Operation.

October 26. After the last 3 inoculations there has been a distinct local reaction, as indicated by the increased frequency of urination; slight hematuria; and pain in the bladder lasting twenty-four hours.

December 11. Frequency of urination much less; feels much better in every way.

December 21. Increased frequency and discomfort again noted after the last dose.

June 28, 1909. Following the inoculation of 0.8 c.c. of 0.0001 on June 18 the temperature rose to 102° F. and lasted for four hours, since when the patient is much improved; the dose reduced to 0.5 c.c. of 0.0001. Since reaching 0.5 c.c. of 0.00001 the inoculations have been given at ten-day intervals.

July 19. Following the inoculation of July 9, 0.5 c.c. of 0.0001 the temperature again arose for a few hours; the dose was reduced to 0.3 c.c. of 0.0001.

Showed a marked increase in weight and improvement in

general condition until the sudden rise of temperature and septic symptoms, which occurred in February, 1910.

February 19, 1910. Patient's temperature suddenly rose from 101° to 105.5° F., and the symptoms and signs of acute septic condition rapidly developed. An operation was immediately performed; the left kidney was removed, and two days following the operation the temperature had again fallen to its former course, that of a remittent temperature from 99° to 101° F.

April 23. Two months after operation, without warning, a severe hemorrhage from the wound occurred, and a second operation was performed, following which the patient was in a precarious condition for ten days.

May 11. Marked improvement was noted; the temperature varies from 98° to 99.5° F., and shortly became normal.

July. Went to Saranac Lake; was given few doses of tuberculin; remained there until early in September.

December 4, 1911. Patient reported in excellent health, excepting an occasional attack of frequent micturition lasting a few hours. Urine normal, tubercle bacilli not found.

Case VII.—Mr. W., aged 47 years. Tuberculosis of both (?) kidneys, prostate, bladder, and cervical glands; eighteen months (?) duration; inoperable; irregular evening temperature; hygienic surroundings favorable. Tuberculin inoculations from March 9, 1908, to September 17, 1909; dosage 0.2 c.c. of 0.0005; second series, October 7, 1909, to November 2, 1910, dosage to 0.6 c.c. of 0.0001; third series, December 9, 1910, to November, 1911. The general condition is good, gain of 42 pounds in weight is maintained; no tubercle bacilli in the urine.

Was referred by the late Dr. Alexander, in March, 1908. Examination by Dr. Alexander revealed the involvement of both ureteral orifices, the trigonum and extending into the fundus; the process was more extensive on the right side. It was considered that both kidneys were involved, although tenderness with some enlargement was noted only on the right side. The patient had been under treatment for chronic cystitis for over two years, the condition had not improved. There had been a loss of weight of 32 pounds and the patient suffered mostly from severe pain in the pelvis which was referred to the bladder and to the rectum; frequent micturition disturbed rest and sleep, while the pain was controlled by codeine and morphine. Urination occurred at least every hour during the late afternoon, after slight exercise as often as every twenty minutes. The urine was thick with pus and blood and showed a large number of tubercle bacilli. The cervical glands on one side of the neck were enlarged and quite firm, forming a mass extending from the tip of the mastoid to the clavicle on the right side. The local treatment, irrigations with silver nitrate and other drugs, was continued.

Proper hygienic measures were advised—living and sleeping in the open air, suralimentation and rest.

Operation was absolutely contraindicated. Tuberculin inoculations were begun March 9, 1908, with 0.1 c.c. of 0.000001.

July 23, 1908. The general health was much improved; patient complains of severe pain at the neck of the bladder and frequent micturation; on cystoscopic examination no local retrogression noted.

September 9. Bladder irrigations with 1 per cent. silver nitrate have been continued, and following this irrigation there has been severe pain and suppression of urine; dosage of tuberculin more rapidly increased.

December 28. During the last ten days patient suffered from attack of acute rheumatic arthritis; was given large doses of aspirin, which increased the irritation of the bladder; tuberculin inoculations 0.3 c.c. of 0.0001.

March 23, 1909. Cystoscopic examination, pus coming from right ureter, left ureteral orifice normal; the bladder about the trigonum appears normal, prostate only slightly involved.

March 26. On account of persistence of pain and frequent micturition, cultures were taken from the urine which still contained large numbers of tubercle bacilli, and streptococcus was obtained in pure culture. A vaccine was prepared and was inoculated with the tuberculin; following this there was a marked focal reaction in the prostate, with pain, swelling and tenderness which persisted for five days.

April 21. Again an inoculation of streptococcus vaccine was given, 41,000,000; no reaction.

April 27. An inoculation of streptococcus vaccine, 30,000,000 and 0.5 c.c. of 0.0001 of tuberculin was given.

May 18. Forty-eight hours after last dose (May 11) there was a slight focal reaction in the prostate and bladder, so that the dose of streptococcus vaccine was decreased to 27,000,000; the tuberculin was not increased.

June 2. The streptococcus vaccine discontinued; marked improvement in the sensitiveness of the trigonum and in the frequency of micturition, which followed the first three doses of streptococcus vaccine.

June 21. Since withdrawal of the streptococcus vaccine (June 2) pain in the bladder, burning micturition and the frequency have increased markedly. Fresh streptococcus vaccine was prepared, which was not used until August 9, for it was considered that the symptoms depended solely on the tuberculous process.

September 17. The vaccine and tuberculin have been continued since August 9. Tuberculin and vaccine now discontinued for three weeks; the symptoms seemed intensified so definitely following

the injection of tuberculin that it was decided to return to small doses after three weeks.

October 7. Tuberculin inoculations resumed, with a dose of 0.1 c.c. of 0.000005.

October 16. Since September 17 (during the time he was receiving no tuberculin or vaccine) symptoms were aggravated and rest and sleep were disturbed on account of frequent micturition which occurred as often as fifty (?) times in one night.

November 9. The dosage of tuberculin has been very slowly increased, resulting in less improvement in his symptoms; for short periods of from two to three hours during the day the urine was voided every ten minutes, and such an attack was followed by intense burning pain in the bladder, which lasted throughout the rest of the day. Intense pain in the bladder occurs also after defecation; a few small clots of blood have been passed in the stools; examination revealed the presence of hemorrhoids; the urine no longer contains blood macroscopically, but is filled with mucus and pus; there has been no fever for the last few weeks, but the sweating continues.

December 7. Dr. Alexander refused to make a cystoscopic examination, on the ground that his general condition was excellent, and that both kidneys were originally involved, and since the bladder symptoms were better he would not make a cystoscopic examination. Since his symptoms had not ameliorated during the last eight weeks, on December 1, the dosage of tuberculin was reduced to 0.1 c.c. of 0.000001.

May 16, 1910. General condition excellent; weight, 142 pounds, a gain of 32 pounds; feels well, but still complains of, for him, a moderate frequency of micturition. Reported to Dr. Alexander who advised him to persist with the tuberculin therapy.

October 25. Dosage of tuberculin inoculation 0.5 c.c. of 0.0001; during the last week, has complained of frequent micturition, for the first time in months. The urine is cloudy, contains a few small granular masses consisting of leukocytes; tubercle bacilli could not be demonstrated; the method of demonstrating the tubercle bacilli was the same as for the previous examinations made since March, 1908. A careful search was made of the stained specimen of pus after centrifugation, and the pus was also inoculated into guinea-pigs; later on, the antiformin method was employed.

November 2. Dosage of tuberculin 0.6 c.c. of 0.0001; has complained again, during last week, of frequent micturition and of burning on micturition, and also of a dull heavy ache which radiates down to the pubes. The tuberculin discontinued for six weeks, at the end of which time a third series of 0.2 c.c. of 0.000001 was advised.

November 30. Symptoms have improved; short attacks of painful urination occur but seldom; his weight is above his former

usual weight of 130 pounds; for some months he has been able to attend to work which calls for little exertion.

December 9. Third series of tuberculin inoculations begun with 0.2 c.c. of 0.000001.

January 19, 1911. Since last visit has gained 7 pounds in weight; feels much stronger than he has felt in years; no dysuria and no frequent micturition; the urine is practically clear and contains no tubercle bacilli. The patient has been returning very irregularly for tuberculin inoculations because he feels so well, and has received no tuberculin inoculation since December 9, six weeks ago.

March 1. Still gaining in weight; feels stronger; during the last few weeks dysuria has not returned.

May 9. Dosage of tuberculin inoculation 0.5 c.c. of 0.000001; weight, 143 pounds; frequency of micturition slightly increased during the last few weeks.

July 26. The patient has returned for tuberculin inoculations at intervals of six or seven weeks; inoculation of 0.5 c.c. of 0.000001, and was advised to discontinue the inoculation unless he could return more frequently.

October 23. Complains that he has not felt so well for a week, although the local symptoms of his tuberculous disease have abated. The urine is free from tubercle bacilli and shows only a few leukocytes; tuberculin inoculations have been discontinued.

December 2. Tuberculin injections begun again, 0.1 c.c. of 0.000001. General health excellent; frequent micturition occasionally occurs and lasts for a few hours; urine free from tubercle bacilli.

Tubes and Pelvic Organs (Gynecological). Such cases have been reported upon favorably by Birnbaum[115] (1907), and by Nathan Raw[116] (in 1910). We have had no experience with such cases.

Miliary Tuberculosis. One may quote Denys:[12] "The process is too rapid to be influenced by B. F.," and one may add by any other kind of tuberculin. The specific therapy for miliary disease will, if it comes, not be a process of active immunization but one of passive immunization, with some particular serum or chemotherapy.

CONCLUSION.

Secondary Infection Modifies. From the nature of the process of active immunization one should expect the results with tuberculin in surgical tuberculosis to be much the same with all anatomical types, and such is the fact. The one modifying factor, aside from that of the individual's response is that of secondary infection, and one may state that "closed" cases, in the sense of Petruschky, do well; and often cases vary according to the summa-

tion of toxic effects from the tubercle bacillus and the secondary invaders.

In surgical conditions the secondary invader is not so to be feared as in the pulmonary and pleural conditions, and the secondary invasions in surgical conditions always call for some other than tuberculin treatment. We may again recall the patience and perseverance exemplified by Petruschky in dealing with such cases and conclude with him that in Koch's tuberculin we have a valuable agent for treating incipient tuberculosis; and may add that until specific therapy has been tried one should never despair of a seemingly hopeless case.

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REVIEWS

RECENT METHODS IN THE DIAGNOSIS AND TREATMENT OF SYPHILIS. (THE WASSERMANN REACTION AND EHRLICH'S SALVARSAN, "606.") By C. H. BROWNING, M.D., Lecturer on Bacteriology in the University of Glasgow, and IVY MCKENZIE, M.D., Director Western Asylums' Research Institute, Glasgow. Pp. 303. Philadelphia and New York: Lea & Febiger, 1912.

THIS book deals exclusively with the Wassermann reaction, salvarsan treatment, and the effect of the treatment on the individual and his serum reaction. It is the most detailed study of the syphilis reaction that has so far appeared in English. The basic principles of hemolysis, specific and non-specific absorption of complement, and the theories of the Wassermann reaction are briefly and clearly analyzed. The preparation of each reagent with the sources of fallacy incident to them and their quantitative differences are studied. Crude antigen extracts are compared as to their antigenic power, with pure lipoids or mixtures of cholesterin, testing them in the presence of the same serums, both syphilitic and normal.

Because of the importance of the reaction in diagnosis, treatment, and prognosis, the emphasis upon the physicochemical factors entering into and influencing the reaction are strongly emphasized. The effort of these workers to introduce a technical modification in the line of greater accuracy deserves much consideration. Their method permits a balanced study of the various antigens and shows: (1) The amount of complement absorption; (2) the delicacy of the various antigen mixtures to weakly reacting syphilitic serums, and (3) the greater uniformity of a lecithin cholesterin mixture as an antigen.

To the clinical application of the tests no undue space is allotted. The importance of the reaction being now generally admitted, the results of most of the workers is briefly reviewed, with the suggestion of some possible clinical problems.

The second half of this work is restricted to the therapeutic agent salvarsan. The history of the brilliant experimental and chemical work which developed rapidly after the recognition by Ehrlich and Berthein of the chemical constitution of atoxyl, is fully given together with a description of the chemical constitution of the

drug salvarsan and of the changes occurring during its preparation for injection. The effect of this drug in the treatment of all forms of syphilis and parasyphilis and those few other conditions in which it has been used are described with many examples and a full review of the literature. The ordinary and accessory after-effects with a conscientious collection of details in the fatal cases so far recorded, have led to the conclusion that, even in those cases in which the drug could be held as the determining factor in the death, the contraindications so often emphasized, were present.

The book is clearly and convincingly written, most of the important theories and studies of the reaction are stated and critically examined. The importance of the reaction both for diagnosis and for the result of treatment is accentuated in every possible way and the need of methods of greater accuracy emphasized. The sincerity of the work is felt throughout and the concise summaries at the end of each chapter are of distinct value. E. P. C. W.

Health and Medical Inspection of School Children. By Walter S. Cornell, M.D., Director of Medical Inspection of Public Schools; Philadelphia; Lecturer on Child Hygiene, University Hospital; Director of Division of Medical Research, New Jersey Training School for Feeble Minded. Pp. 614; 200 illustrations. Philadelphia: F. A. Davis Company, 1912.

Preventive medicine must necessarily deal directly with the young for only by checking up and treating the beginning defects and diseases of children can we hope to develop stronger and more healthy adults. Cornell has made a valuable contribution to the science of preventive medicine in the present volume. Heretofore, parents or family physicians either from lack of knowledge or carelessness overlooked the minor ills of children until the latter were more or less incapacitated by them. Municipal authority is now wisely endeavoring to do this neglected work by means of school inspection, visiting nurses, and by public lectures and exhibits. The results of this systematic supervision of the health of our school children will be far reaching in the improvement of the general health of the community.

The author has been a pioneer in this work and the present volume is based on his six years experience as a medical inspector and the study and examination of over 35,000 children.

In the first division of the work the subject of medical inspection is taken up from various standpoints. This discussion is thorough and complete and contains many useful criticisms of the present methods with suggestions for their correction. In the second division under the heading Hygiene, the subjects of illumination,

ventilation, physical education, and recreation are discussed. In the third division on Defects and Diseases, making up about half of the book, the various divisions of the physical examination are taken up in detail. Practical methods of examination are given with short descriptions of some of the commoner conditions found.

The work is unusually well systematized, the subjects lead up to each other in a logical order and the subject matter deals at all times with practical things. The author wisely emphasizes the fact that after all the success of the work of medical inspection depends on the inspector and his ability to confine himself to essential parts of the work, not to overlook important conditions on the one hand, or to become too much involved in unnecessary details on the other.

The work should be of interest to any physician or student of medicine, but especially to those about to enter inspection work or social service. To such it will serve as a book of instruction, and the valuable criticisms and suggestions point the way along which this important work may be improved and perfected.

F. H. K.

TUMORS OF THE JAWS. By CHARLES LOCKE SCUDDER, M.D., Surgeon to the Massachusetts General Hospital; Lecturer on Surgery in the Harvard Medical School, etc. Pp. 391, 353 illustrations. Philadelphia and London: W. B. Saunders Co., 1912.

DR. SCUDDER appears to have been studying the subject of tumors of the jaws for a number of years, and he has collected a vast amount of valuable information. The volume is replete with clinical material (largely original), comprising both the patients' histories and illustrations showing their appearance at various stages of their disease, as well as the results of operation and of the pathological study of the tissues removed.

The work is divided into nine chapters: The first is on epulis; then follow chapters on sarcoma, benign tumors, the odontomas, and carcinoma. Then there is an excellent chapter on diagnosis and operative treatment. Finally, a short chapter on tumors of the palate, and closing chapters on leontiasis ossea, and on prosthesis. The chapter on leontiasis is based largely on the work of Kanavel.

Scudder is less pessimistic than is Bloodgood about the more malignant types of sarcoma of the jaws, and urges extremely radical operation which he does not agree with Bloodgood in regarding as useless either in prolonging life or in affording a hope of ultimate cure.

Less attention is paid to microscopic pathology, as is quite proper in a work of this kind, than to gross pathology, which is well considered. When one studies the book hard, the clinical symptoms on which diagnosis is based become apparent; but a little or rather a good deal of condensation would do the volume no harm. There are so few words on a page, and the pages are so cut up by illustrations and the insertion of case histories (most of them undated, and all in full-sized type), as well as by what seems to us needless elaboration of display typing and enumeration of facts seriatim, that it is difficult to follow the author's thesis. Dr. Scudder is too modest in his exegesis, and his volume is not sufficiently dogmatic to claim for itself the recognition it merits. But as the work is not intended for a text-book, and as the subject is well worthy of serious and painstaking study, these features may well be condoned. There is no doubt that every teacher of surgery, no matter how experienced he may be, as well as every practical surgeon, will be able to glean an immense amount of valuable information from this volume, if he takes sufficient trouble.

A. P. C. A.

DISEASES OF THE STOMACH. By MAX EINHORN, M.D., New York Post-graduate Hospital. Fifth edition; pp. 531; 112 illustrations. New York: William Wood & Co.

WHEN a medical book runs into five editions in sixteen years it is *prima facie* evidence that it is good and has been favorably received by the profession.

Einhorn's *Diseases of the Stomach* is written on a comprehensive plan and in rather a (perhaps too) personal vein. The author discusses his subject in successive chapters dealing with anatomy and physiology, methods of examination, diet, local treatment of the stomach; then follows four chapters devoted to organic diseases of the stomach, exhibiting constant lesions, then three chapters covering functional diseases with variable lesions, and individual chapters in which are discussed abnormalities in size, shape, and position of the stomach, nervous affections of the stomach, and the condition of the stomach as seen in diseases of the other organs.

For a book of this character and scope some of these chapters is far too brief and elementary, notably those on diet, anatomy, and physiology, while others are discussed at too great length, giving space to theories and methods that are inaccurate, obsolete, and unscientific.

It is noticeable that the author advocates the use of many special instruments, several of which in the hands of other careful investigators have failed to give accurate and have often given misleading results.

It is to be much regretted that in this last revised edition the literature has not been brought more up to date; few of the references appended being as recent as 1906, while the great majority date back from ten to twenty years ago.

One other criticism: For a book of this character the illustrations are much below standard, and such as there are would be improved and much more intelligently understood had the special points of interest to which the author draws attention been more clearly indicated.

These criticisms should not detract from the acknowledged worth of this book, written by a man who has done so much to blaze the trail through the labyrinth of gastric diseases, and they are offered only in the hope that in the future editions that must follow this one, these faults will be corrected. V. L.

THE DISEASES OF INFANTS AND CHILDREN. By EDMUND CAUTLEY, M.D. Cantab., F.R.C.P. Lond., Senior Physician to the Belgrave Hospital for Children; Physician to the Metropolitan Hospital, etc. Pp. 1042. New York: Paul B. Hoeber.

THE object of the author in writing this book, as stated in the preface, was to "describe the ailments of children in a form suitable for the general practitioner of medicine and sufficiently detailed to render further reference to other works unnecessary, except in the case of unusually rare diseases. . . . The descriptions of some common ailments have been curtailed inasmuch as in a book for graduates it is unnecessary to amplify the minutiæ of symptoms." For the same reason, illustrations and charts have been omitted, the author holding that the kindergarten method of teaching, advantageous for the student, may prove a disadvantage to those in active practice for "the expectation of seeing the typical cases of pictorial illustration increases the danger of overlooking those early stages in which disease is amenable to treatment." If that is a valid reason for omitting well-chosen illustrations in a book for graduates, such an argument would apply with even greater force to the instruction of medical students, since they have not the experience to correct a wrong impression conveyed by an illustration. However, between a book padded with illustrations and one devoid of them, the latter is undoubtedly preferable for, after all, the best illustrations for the text are those furnished to the mind's eye of the reader out of his own experience.

The main fault we have to find with this work is the literary style in which most of it is written—abrupt and jerking. This is probably due to the effort at condensation and perhaps arises also from consulting many authorities, for when the author writes

from his own experience as in the valuable chapter on congenital pyloric stenosis the language flows more smoothly. Occasionally the author's meaning is ambiguous; thus, on page 239 he says: "Nearly all infants with adenoids are rachitic, but rachitic children are constantly [frequently (?)] free from adenoids;" and unusual words like "merrythought" would send nine out of ten American physicians to the dictionary. Typographical errors are rather frequent, the most amusing one being "fetal incontinence;" and Latin terms are often not italicized.

But, the above defects have not prevented the author's extensive experience and ripe judgment from making every page valuable, and the whole subject of pediatrics is covered in such a way that the book is excellent as a work of reference for the general practitioner. It is interesting to note that the author prefers cane sugar to milk sugar in infant feeding and opposes the use of "one cow's milk." He explains in a clear way how to dilute mixtures with low proteid percentages may cause indigestion with the appearance of curds in the passages, there being not enough casein to use up the acid of the gastric juice so that the uncombined acid attacks the curd already formed, making it tougher and more resistant to the action of the digestive ferments. The existing confusion in the nomenclature of the milk proteins is regretted and a helpful explanation of the terms is given. The calorimetric method of regulating the diet is described briefly and dismissed with the comment "These calculations are interesting, but not of very much value in practice."

In discussing infant mortality the interesting statements are made that the lowest death rate is found in the British peerage and the fishers of the Faroe Islands, and that "overlaying" kills 1500 infants yearly in England and Wales. This latter statement would make it seem that there is culpable if not criminal negligence, in view of the comparative rarity of such an accident elsewhere.

It is good to see emphasis laid on the value of opium as soon as the diagnosis of intussusception is made; on the need for laxative medicines at times in overcoming constipation in infants; on the importance of giving large doses of antitoxin early in diphtheria; and on the possibility of breathing exercises causing deformities of the chest in rachitic children with adenoids.

The section on the nervous system is commensurate with the importance of the subject, especially from the standpoint of the general practitioner who will find many helpful suggestions in it.

The author is non-committal on the existence of Dukes' fourth disease giving a short description but saying that the evidence is in favor of some epidemics being cases of mild scarlet fever. Like most of us, he has probably never seen anything that suggested the existence of the fourth disease. We cannot agree with the author in the apparent importance which he attaches to doctors,

attendants, and cats in the dissemination of measles, but we are in entire accord with him in his judgment of drug values in the treatment of pertussis. A. H.

THE NEW PHYSIOLOGY IN SURGICAL AND GENERAL PRACTICE. By A. RENDLE SHORT, M.D., B.S., B.Sc., F.R.C.S., Registrar Bristol Royal Infirmary; Senior Demonstrator of Physiology, University of Bristol. Pp. 201. New York: William Wood & Co.

THE author has presented a book to the medical world of a character, varied and diverse in the number and variety of subjects dwelt upon. Dealing primarily with physiology, we find nevertheless a smattering of pathology, a bit of histology, a modicum of clinical diagnosis, some chemistry and therapeutics, while here and there throughout the volume even the dosage of individual drugs is given. Furthermore, we are hurried from the thyroid, the parathyroid, and the pituitary glands to some studies in digestion and absorption, from here we hastily garner some facts about blood pressure, but in a few minutes are thrust into the interesting mazes of the hemorrhagic diathesis. So we go through various subjects, uric acid, diabetes, and chloroform poisoning for example, while in the last two chapters we lightly jump, figuratively speaking, from cerebral localization to cutaneous anesthetics.

Written in this disjointed way, the book will never claim recognition as a book of reference, the subjects are for the most part dwelt upon in a too superficial and elementary manner. We find, however, that the author has published a most interesting and entertaining volume if we consider each chapter as a pleasing essay on the physiology of a certain subject with its application to practical medicine. He has taken care to sift the known from the unknown, the recognized and indisputable facts from the conjectures and theories of the various physiological problems as yet unsolved or but incompletely unravelled. J. H. M., JR.

JUCKENDE HAUTLEIDEN. By DR. S. JESSNER, Sanitätsrat. Fourth revised edition; Pp. 120. Würzburg: Curt Kabitzsch.

THE author has endeavored to cover the entire domain of pruritic conditions in the short space of 120 pages. Itching conditions without an outbreak upon the skin are discussed in some detail; the various physiological or pathological changes are cited as a cause, particularly, for the universal cases of pruritus. The more

localized cases of pruritus, bath pruritus, pruritus hiemalis, and pruritus of the genitalia are cited. Particular attention is given to urticaria, the prurigo of Hebra, scabies, and pediculosis. Numerous prescriptions are mentioned as being efficacious for the pruritic conditions. Mitin is the base used for a large number of the external preparations. F. C. K.

UEBER NEUROREZIDIVE NACH SALVARSAN UND NACH QUECKSILBER BEHANDLUNG. By DR. J. BENARIO. Pp. 195; 1 illustration. Munich: J. F. Lehmann.

BENARIO's monograph is at once timely and interesting. After Wechselmann published his observations on Neurorezidives following salvarsan injections, a short search of hospital records unearthed 10 cases following mercurial treatment. One case only was found recorded in literature, although as early as 1610 Guarinori reported a case showing simultaneously a nerve lesion, primary sore, and exanthem.

In this book he reports 211 salvarsan and 121 other cases collected from Ehrlich's laboratory, correspondence, and from the literature. Analyzing his statistics, he incidentally notes preponderance among males, aged between twenty-five and forty years. Alcohol and, in a lesser degree, nicotine, predisposed to nerve lesions. Bakers and cooks also have more nerve involvement. Extra genital infections occurred in 12.3 per cent., chancre cephalique in 7 per cent. His numbers substantiate earlier observations of frequent brain involvement in cases of face chancre. Knorr first observed the association of nerve lesion and papular eruption. In this list 60.7 per cent. of the cases had papular or papulopustular exanthems. The Herxheimer reaction was present in 16 cases. Headaches were a prodromal symptom of rezidive in 50 cases and concomitant phenomena in 58 cases.

A detailed table of variations in manner and kind of treatment is added, with the conclusion that residues do not occur if the dose is sufficiently large or repeated within a short interval. The neurorezidive is an inflammatory focus occurring along the course of one or more cranial nerves. Three theories for these foci have been advanced: (1) A direct toxic injury to the nerve by the drug; (2) an indirect injury to the nerve, causing a place of lessened resistance where the colonization of the treponema takes place; (3) the escape of some treponema from the action of the drug and their subsequent growth in a practically new medium.

The pathology of syphilis itself is not entirely cleared up. The spirochetes have been found in the blood stream, but have a marked predilection for the lymph vessels, an explanation of the early

involvement of the lymph glands and the preponderance of lesions at the base of the brain. Recent writers believe the spirochetes proceed in the perivascular lymph spaces of the bloodvessels and of the pia. In the diseased vessel wall the organisms and lymphocytes are found, confined at first to the adventitia and media; later, also in the intima. The lymphocytic infiltration of the brain membranes shows itself in the lymphocytosis of the spinal fluid, a condition that persists after the disappearance of all symptoms.

In studying the 194 cases under the two modes of treatment, namely, mercury and salvarsan, he found that the same nerves are affected and in about the same order of frequency. This close agreement speaks most strongly against a neurotoxic action of salvarsan, and Benario thinks that this and the microscopic pathological picture prove that it is a true syphilitic process. He bases this belief upon (1) the long interval between the injection and nervous manifestation (one to four months); (2) the type of pathological process; (3) the fact that no rezidive occurs in non-syphilitics treated with salvarsan; (4) that in cases with already existing brain syphilis neurorezidives are not observed; and (5) neurorezidives recover under salvarsan.

The book touches fully and with a wealth of detail on the more important facts relating to this phase of syphilis. He urges more careful attention to changes in special sense organs in the early stage of syphilis, more energetic treatment, and control of treatment by the results of the Wassermann reaction and lumbar puncture. The long list of cases are tiring and the detailed treatment of each nerve lesion could be shortened with advantage.

E. P. C. W.

OPHTHALMIC YEAR BOOK FOR 1911. Edited by EDWARD JACKSON, M.D., THEODORE B. SCHNEIDEMAN, M.D., and WILLIAM ZENTMAYER, M.D. Pp. 455; 31 illustrations. Denver: Herrick Book and Stationery Company.

THE eighth volume of the *Ophthalmic Year Book* well illustrates the enormous increase in ophthalmic literature during the last eight years. The first volume in 1904 contained 260 pages whereas the present volume contains 455 pages with references to almost three thousand journal articles. The first 14 pages are devoted to biographic notices and then follows a digest of the literature classified as in the previous volumes. In the text, heavy-faced type has been used for the names of authors and the editors have returned to the previous custom of giving the page, in the various journals, on which any particular article may be found. In a volume of this character, these changes add much to the convenience of the reader.

Undoubtedly all subscribers to the Year-book have heard with much regret that its publication has been suspended, although to quote Dr. Jackson, "the purpose is not abandoned." It is hoped that the near future will find it re-established along lines where its publication may be resumed under conditions less arduous and more advantageous for its editors, for since its inception it has been a profitable convenience to those ophthalmologists interested in the literature in their particular branch of medicine. T. B. H.

FOURTH SCIENTIFIC REPORT OF THE INVESTIGATIONS OF THE IMPERIAL CANCER RESEARCH FUND. By DR. E. F. BASHFORD, General Superintendent of Research and Director of the Laboratory. Pp. 223; 63 plates; numerous charts and tables. London: Taylor & Francis.

THIS volume consists of three papers, preceded by a most interesting introduction by Dr. Bashford. The first paper on "Spontaneous Tumors in Mice," by M. Haaland, treats of a large number of spontaneous tumors of mice observed since the *Third Scientific Report* was prepared. "These tumors consist of carcinomas and sarcomas occurring in a variety of sites other than the mamma and are considered from clinical, pathological, histological, and experimental standpoints." From this study the writer believes he has produced evidence of possible local causes of tumor formation and lays considerable stress on local irritation as an etiological factor. The second paper on "Cancerous Ancestry and the Incidence of Cancer in Mice," by Dr. J. A. Murray, deals with breeding experiments with mice of known ancestry. The conclusion is drawn that female mice in whose ancestry cancer of the mamma has occurred not further back than the grandmothers, are distinctly more likely to develop the disease spontaneously in this organ than those in whose ancestry the history of cancer is remote. The third paper on "The Behavior of Tumor Cells during Propagation," by E. F. Bashford, is a general survey of the observations made on the tumors observed in the laboratory during a period of eight years and yields "evidence of the validity of the conclusion that the cancer cell is a biological modification of the normal cell."

All the studies show the thoroughness and attention to detail which characterize the work in this laboratory. The studies are presented *in extenso*, are splendidly illustrated with microphotographs and microscopical drawings, and are rendered additionally clear with charts, tables, and diagrams. The book is of great value to those occupying themselves with cancer as a biological problem and the introduction is of such a character as to make the studies available for the less intensively specialized reader. H. T. K

CLINICAL LECTURES ON THE ACUTE ABDOMEN. By WILLIAM HENRY BATTLE, F.R.C.S.; Surgeon to St. Thomas' Hospital, and Joint Lecturer on Systematic Surgery in the Medical School, etc. Pp. 107; 10 illustrations. New York: William Wood & Co. 1911.

THE author has grouped together in this small book of a clear and interesting review of those acute and dangerous conditions which are always of great importance to the general practitioner and surgeon. The term "acute abdomen," however, is open to the criticism that only pathological conditions of the abdomen can be acute, not the abdomen itself. A fair indication of the value of the book is found in the various affections discussed: Acute appendicitis and its complications; perforations of the gastro-intestinal tract; acute intestinal obstruction; acute pyosalpinx and its complications; extra-uterine gestation; acute hemorrhagic pancreatitis; acute dilatation of the stomach; embolism and thrombosis of the mesenteric vessels; and infections of the gall-bladder with its complications. There is no attempt to enter into details in the discussion of the various conditions, but to present them as they occur in practice as surgical emergencies. As a whole, the work is lucid and practical, and will be of much value to any one who has to assume the responsibility involved in the care of these dangerous cases. It is not necessary to agree with the author in everything he says; for instance, that catgut should not be used at all in acute abdominal cases, or that the medical adviser should be so skilled in the recognition of the various aspects of appendicitis that he should be able to say definitely when immediate operation is "imperative." T. T. T.

DENTAL ANESTHETICS. A TEXT-BOOK FOR STUDENTS AND PRACTITIONERS. By WILFRED E. ALDERSON, M.D. (Durham), M.S., B.Hy., D.P.H., Honorary Physician, Newcastle-upon-Tyne Dispensary; Senior Honorary Anesthetist, Newcastle-upon-Tyne Dental Hospital, etc. Pp. 100. New York: William Wood and Company, 1911.

ALTHOUGH the title indicates that the book is one especially intended for dentists, yet it should be most useful also to the medical student and practitioner, as it gives in a concise and complete form the action, choice, and methods of administration of the various anesthetics in common use. The author agrees with American teaching in regard to the routine use of ether in preference to chloroform. The volume is completed by a chapter on analgesia or local anesthesia, by John Bolam, L.D.S., speaking more particularly of its application in dental operations. R. H. I.

PROGRESSIVE MEDICINE. A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES AND IMPROVEMENTS IN THE MEDICAL AND SURGICAL SCIENCES. Edited by HOBART AMORY HARE, M.D., Professor of Therapeutics and Materia Medica in the Jefferson Medical College and Physician to the Jefferson Medical College Hospital, etc., assisted by LEIGHTON F. APPLEMAN, M.D., Instructor in Therapeutics, Jefferson Medical College, Philadelphia. Vol. II, June, 1912. Pp. 391; 65 illustrations. Philadelphia and New York: Lea and Febiger.

THE June number of *Progressive Medicine* opens with a contribution of 32 pages by William B. Coley on hernia. In addition to the commoner forms of hernia rare varieties are discussed, especial attention being paid to diaphagmatic hernia.

General surgery of the abdomen is dealt with by John C. A. Gerster in an admirable article of 96 pages. He takes up a wide variety of subjects of which may be mentioned a careful review of Clairmont and Handek's monograph on the radiology of the stomach, which affords an excellent discussion of the diagnosis of gastric conditions, cecum mobile, the operative treatment of chronic intestinal stasis as advocated by Lane, a discussion of Heyde's noteworthy contribution on the etiology of the inflammation of the appendix, cholangitis, and acute pancreatitis.

The contribution on Gynecology by John G. Clark embraces 112 pages almost half of which are given over to a thorough discussion of cancer and fibroid tumor of the uterus. Among the other subjects to which he devotes considerable attention are: Pelvic inflammatory diseases, menstrual disorders, medical or non-operative treatment in gynecology, the ovary, the bladder, and ureters, and recent advances in the operative treatment of gynecological conditions.

One of the most interesting features of *Progressive Medicine* for a number of years has been Alfred Stengel's article on the blood, metabolic diseases, and diseases of the thyroid gland, nutrition, and lymphatic systems. In importance and careful preparation his present contribution compares favorably with those of previous years. Leukemia and pernicious anemia are delt with at some length; hemophilia and the various blood dyscrasias including scurvy are next taken up; then, after discussing leukocytes and Banti's disease, considerable attention is given to diabetes mellitus, gout, obesity, and exophthalmic goitre.

In a short but well written article of 24 pages Edward Jackson takes up recent advances in ophthalmology. He considers his subject systematically under the following headings: Diseases of the conjunctiva, diseases of the uveal tract, glaucoma, the crystalline lens and vitreous, and the retina, optic nerve, and tracts.

G. M. P.

PROGRESS

OF

MEDICAL SCIENCE

MEDICINE

UNDER THE CHARGE OF

W. S. THAYER, M.D.,

PROFESSOR OF CLINICAL MEDICINE, JOHNS HOPKINS UNIVERSITY, BALTIMORE, MARYLAND,

AND

ROGER S. MORRIS, M.D.,

ASSOCIATE PROFESSOR OF MEDICINE, WASHINGTON UNIVERSITY, ST. LOUIS, MISSOURI.

A Test of Gastric Motility.—I. BOAS (*Deutsch. med. Woch.*, 1912, xxxviii, 455), reviews briefly the methods of measuring gastric motility. No very satisfactory clinical method exists. He finds, however, that the results of Moritz, who showed that the human stomach is nearly empty one-half to three-fourths of an hour after drinking 500 c.c. of water, are substantially correct. There is ample experimental evidence to show that in dogs similar conditions exist. Boas utilizes this fact as the basis of his test; (1) because water which is drunk does not stimulate the secretion of gastric juice, at least, to any appreciable extent, and causes no pylorus reflex; (2) fluid which remains in the stomach is easily recovered; (3) the procedure is not complicated by layer-formation or sedimentation; (4) since relatively large quantities pass the pylorus in a short time, the determination of motility can be made within a half hour, even in pathological cases. With pure water there is one objection; it is impossible to be certain that all fluid remaining in the stomach has been completely removed. For this reason the addition of a dye is desirable. Boas selected chlorophyll. It is well adapted to the purpose, since it is absorbed neither from the stomach nor the intestines. The technique adopted is the following: The test is always performed on a fasting stomach. If the organ is not empty, it should be washed until the water comes away clear. The patient is then given 400 c.c. of water to which 20 drops of chlorophyll (concentrated aqueous solution) have been added. Thirty minutes after the patient has drunk this, the stomach tube is passed. With normal motility about 50 to 60 c.c. are recovered. To determine whether all of the residual water has

been obtained, more fluid is poured through the tube. For this purpose a 1 per cent. solution of soda is employed. If X represents the residue recovered, then 400 − X c.c. of soda solution are poured through the tube and siphoned off. The quantity of chorophyll in the wash water is then determined colorimetrically as follows: Prepare a stock solution of chlorophyll 1 to 400 and make dilutions of this of 0.5, 0.3, 0.2, 0.1 and 0.05. (The stock solution 1 to 400 corresponds to that which the patient drank). The wash water is filtered and the color intensity compared with the solutions prepared as above. If it is found, for example, that the green of the wash water corresponds with the chlorophyll solution 0.2, this means that 0.8 chlorophyll has passed through the pylorus in thirty minutes, or, expressed in percentage, 80 per cent. The patient should be instructed not to swallow saliva during the test, as it interferes with the quantitative determination of the chlorophyll. As the test solution is green and patients occasionally object to drinking it, Boas places it in green glasses. Boas has made observations on about one hundred and fifty patients with gastric disease and describes the results found in various conditions.

Ehrlich's Aldehyde Reaction in Circulatory Diseases.—A. JONASS (*Wien. klin. Woch.*, 1912, xxv, 375) has investigated the relationship between competence of the right heart and Ehrlich's aldehyde reaction. He finds that when there is insufficiency with consequent chronic passive congestion of the liver, the aldehyde reaction is positive. The positive reaction is, therefore, in a way indicative of the work done by the right heart in such cases. The reaction also becomes positive in asthma during the attacks, disappearing in the intervals.

Experimental Eosinophilia after Intraperitoneal Injection of Protein and the Relation of Eosinophilia to Anaphylaxis.—H. SCHLECHT (*Archiv f. exp. Path. u. Pharmakol.*, 1912, lxvii, 136), has investigated the eosinophilia seen in experiments with animals after injections with foreign protein and following anaphylactic shock. He finds that continued parenteral administration of foreign protein produces an eosinophilia in the blood of guinea-pigs and also in the peritoneal cavity. Cleavage products of proteins (as far as peptones) have the same effect, but amino-acids seem to be inert. Occasionally an increase of mast cells is seen. The eosinophilia is seen after a certain incubation period, during which eosinophile cells may be discovered to be in diminished quantity. The main source of the cells is the bone marrow; local production in the tissues may occur, but could not be established. Animals which have survived the anaphylactic shock react with a marked eosinophilia. Immune animals and those in an anti-anaphylactic state exhibit a further increase of the eosinophilia following renewed injection of the foreign protein. Eosinophilia is a favorable prognostic sign, both in experiment and in practice, in connection with anaphylaxis, since it is the expression on the part of the body of a reaction against toxic substances—a protective reaction. In this sense the post-infectious eosinophilia may also be interpreted. Schlecht points out the similarities between the conditions observed in anaphylactic experiments and in bronchial asthma, in both of which blood eosinophilia and local pulmonary eosinophilia are observed.

Action of Salvarsan in Anthrax.—Bettmann and Laubenheimer (*Deutsch. med. Woch.*, 1912, xxxviii, 349) report clinical and experimental results of the treatment of anthrax with salvarsan. Two patients presented themselves with typical anthrax infection. Each was given salvarsan 0.3 gm. intravenously and five days later a second dose of 0.4 gm. In each case recovery took place. The subsidence of the local signs was striking after forty-eight hours from the first injection. Within five days no bacilli were found in the pustules, and cultures were negative. Since anthrax usually terminates in recovery in human infections, it was decided to test the action of salvarsan experimentally. This was done with guinea-pigs. The result was that animals treated within five and a half hours after experimental infection almost always recovered, while controls, untreated, succumbed within two days. Animals which had recovered under salvarsan were re-inoculated with anthrax several weeks later, without treatment. They died promptly from the infection.

Chemistry and Toxicology of Ascarides.—F. Flury (*Archiv f. exp. Path. u. Pharmakol.*, 1912, lxvii, 275), reports the results of painstaking and extensive researches into the chemistry and toxicology of Ascarides. Little is known of the biochemistry of the intestinal parasites and it is practically certain that the explanation of most, if not all, of the symptoms associated with such infections will not be entirely clear until such knowledge is obtained. Only the briefest partial summary of the present communication is possible. Flury's experiments were made on Ascaris lumbricoides and Ascaris megalocephala. On the relation of the body constituents and excrements of ascarides to the symptoms observed in the host, the following facts have been determined. Both in the body substances and in the excreta numerous substances are present which are capable of causing local irritation, hyperemia, inflammation, and necrosis. Most important in this connection are the volatile aldehydes of the fatty acids (which probably arise from the reduction of the corresponding acids), also the free volatile fatty acids of which the author isolated valerianic and butyric acids in considerable quantity and in smaller amounts, formic, acrylic, and propionic acids. Furthermore, local irritants, such as alcohols and esters of the ethyl-, butyl-, and amyl- series, were found. It is, no doubt, these substances which are largely responsible for the severe irritative symptoms, so well known to zoölogists, and for the hypersusceptibility which is not uncommon following repeated action of aldehydes; urticaria-like lesions are known to result from the vascular effects of esters of acids. In infected patients the prolonged action of such substances on the intestinal mucous membrane may well lead to symptoms. In addition to their irritative effects Flury has shown that the free acids, even in dilute solution, have a corrosive action which may injure the intestine. The digestive disturbances, which at times occur in ascaris infections may be due to the factors named. The absorption of substances from the intestine may be still more important. The conditions are present for the production of a chronic acidosis. Symptoms referable to the central nervous system. such as hallucinations, chorea, hysteria, epilepsy, delirium, etc. are explicable through chronic poisoning with aldehyde, especially atypically acting compounds of the amyl series.

Flury considers valerianic, formic, and acrylic acids particularly important in relation to nervous symptoms. The so-called meningitic form of Ascaris infection can be caused by any of several substances (alcohols, aldehydes, esters) acting on the meninges and producing increased intracranial tension from stimulation of the secretion of cerebrospinal fluid. Of nitrogenous compounds Flury has found a capillary poison which, when administered to dogs, causes fatal intestinal hemorrhage. The purin bases isolated may cause marked irritative effects in the central nervous system. The anemia seen at times in patients infected with ascaris may be due to the continued absorption of hemolytic substances. In this connection the most important are the unsaturated fatty acids and acrylic acid. Furthermore, injury to the blood may be due to reducing substances and those which inhibit coagulation. Additional toxins may be absorbed when the parasites die in the intestines and undergo decomposition.

Deodorizing Excreta.—A. CZERNY (*Berlin. klin. Woch.*, 1912, xlix, 450), refers to the disagreeableness of odors in the sick room. Not only the patient but the attendants as well are annoyed. In a large hospital ward the nuisance becomes even more serious. A simple deodorant for feces is highly desirable. At the suggestion of Uhlenhuth, Czerny tried antiformin. He finds that about 50 c.c. of 10 per cent. antiformin causes immediate and complete deodorization of fluid or soft stools. With formed feces the result is accomplished somewhat less quickly by pouring antiformin upon them, for the quantity used is not sufficient to cover the feces. Another use for the deodorant is its application to clothing, etc., repeatedly soiled by children. Even after the most thorough washing, some odor usually remains, but rinsing in 5 per cent. antiformin completely removes the odor without injury to the fabric. Again the method possesses an advantage in hospitals or dwellings which are unscreened, since the suppression of the odor greatly lessens the fly nuisance. Because of the low cost of antiformin (in Germany) the method may be widely applied.

Leukocytic Inclusions in Scarlatina.—M. KRETSCHMER (*Berlin. klin. Woch.*, 1912, xlix, 499), confirms the findings of Döhle who recently reported inclusions in the polynuclear neutrophile cells in scarlet fever. Kretschmer has found Manson's stain the most satisfactory for the purpose. A stock solution of 2 gm. methylene blue dissolved in 100 c.c. of boiling 5 per cent. borax solution is prepared. The blood smears are fixed in methyl alcohol, or in other ways, and are stained with a dilution of the stock solution, which should be transparent when held to the light. Stain 10 to 30 seconds, wash, dry, and mount. Red blood cells are light green to greenish blue, nuclei of leukocytes dark blue with reddish tint, and the inclusions are usually a somewhat paler blue, while the proplasm of the white blood cells is practically unstained. The inclusions vary in number from one to six. The form is not uniform; round or oval bodies the size of cocci, at times placed close together, appear, or crescent-shaped bodies with round or pointed ends are seen. They are invisible in the fresh specimen or with dark field illumination. Kretschmer has found these inclusions in the neutrophilic cells of 30 consecutive cases of scarlatina without exception.

From the beginning of the infection, even before the eruption appears, they are present in the great majority of cells, so that with the leukocytosis, which is usually present, there is no difficulty in finding them. They persist till the fourth day and may be found as late as the twenty-eighth day following the onset. With recrudescence of fever the bodies do not reappear in the blood. Kretschmer has been able to observe only 2 cases before the eruptions occurred. In one, the bodies were present in a number of the white cells the day preceding the eruption, in the other they appeared with the eruption. A new-born infant whose mother became ill with scarlatina a few days after its birth, escaped infection; in the mother's blood the inclusions were present, in the infant's absent. In several instances where the eruption was atypical, the presence of the inclusions settled the diagnosis. In other diseases Döhle found similar inclusions in only 3 instances—1 case of pneumonia and 2 of carcinoma. Kretschmer has examined 70 other individuals, 20 of whom were normal, and found inclusions in 4—1 case of pneumonia with suppurating cervical glands and 2 cases of diphtheria with streptococcus empyema and 1 of tuberculosis. In the 3 septic cases, he thinks it possible that scarlatina played a part in the etiology, but in a streptococcus septicema, no inclusions were found. He has observed only 2 anginas, one follicular tonsilitis and one Vincent's angina; neither showed inclusions. The inclusions bid fair to be of great significance in the differential diagnosis of exanthemata, Kretschmer believes.

The Establishment of Treponema Pallidum as the Causative Agent of Syphilis, and the Cultural Differentiation between this Organism and Certain Morphologically Allied Spirochetæ.—Hideyo Noguchi (*Canadian Med. Assoc. Jour.*, 1912, iv, 269) reports that to establish an etiological relationship between an organism and the morbid process associated with it, Koch has postulated that the organism must be found constantly in sufficiently large numbers, that it must not be found in other diseases, and that it must be capable of producing similar pathological changes, when introduced into a suitable host in pure culture, as it does in the disease of which it is supposed to be the cause. In addition at present, immunity, anaphylaxis, and allergy have been proved to be essential factors in the determination of an organism as cause of a given disease. Noguchi gives the history of the investigations in morphology, animal innoculation, and for growth in pure culture, which have established Treponema pallidum as the cause of syphilis. Culturally Treponema pallidum shows strict anaërobiosis, requires fresh sterile animal or human tissue and serum in the media, does not produce coagulation or a putrefactive odor. The spirochetes grow by longitudinal division. They differ from the microdentium, a morphologically similar organism, by the facts that the latter grows more easily, is less anaërobic, produces a putrefactive odor, and after several weeks in fluid culture may produce a loose coagulation. In order to use the pure culture of Treponema pallidum for advancing knowledge of syphilis, immunity, and anaphylaxis must be considered. Noguchi found an allergic state of the skin to be present in almost every case of the tertiary stage, and in a large percentage of cases of latent and hereditary disease. By introducing a small quantity of a devitalized pure culture of pallida into the epidermis in such, a reaction is

produced comparable to Von Pirquet's tuberculin for tuberculosis. Noguchi has called this the luetin test. Noguchi believes that this reaction has its own sphere, being of prognostic value since it does not develop until the allergic state of the skin appears, indicating that the injection either is well borne, or is under better control due to treatment. Negative clinical symptoms or serological examinations do not show this. However, the significance of luetin will be demonstrated only through careful observations made by clinicians in different fields of medicine in the future.

SURGERY

UNDER THE CHARGE OF

J. WILLIAM WHITE, M.D.,

FORMERLY JOHN RHEA BARTON PROFESSOR OF SURGERY IN THE UNIVERSITY OF PENNSYLVANIA AND SURGEON TO THE UNIVERSITY HOSPITAL,

AND

T. TURNER THOMAS, M.D.,

ASSOCIATE PROFESSOR OF APPLIED ANATOMY IN THE UNIVERSITY OF PENNSYLVANIA; SURGEON TO THE PHILADELPHIA GENERAL HOSPITAL, AND ASSISTANT SURGEON TO THE UNIVERSITY HOSPITAL.

Operation for Perforated Stomach and Duodenal Ulcers.—LAUPER (*Zentralbl. f. Chir.*, 1912, xxxix, 286) refers to Hoffmann's case reported by Offenberg in the *Zentralbl. f. Chir.*, 1911, No. 50 (abstracted in this journal, for March, p. 449) and Lauper reports his results with the same principles of treatment. About five years ago he had a case of ulcer at the pylorus with a perforation on the lesser curvature admitting the index finger, which came to operation fifteen hours after perforation with very marked symptoms of peritonitis. Closure with reliable sutures seemed to be impossible. A purse string suture going wide of the margins, succeeded only in approximating the edges somewhat, but did not completely close the perforation. A retrocolic gastro-enterostomy with a wide anastomotic opening, admitting three fingers, was performed and the site of the perforation was tamponned. The peritonitis was treated in the usual manner. After the removal of the tampon, at the end of a week, no stomach contents escaped and healing followed. In a case of perforation of an infiltrating cancer of the stomach with diffuse peritonitis, which was operated on about ten hours after perforation, closure of the perforation by suture was impossible and a simple strong tampon was depended on. This was allowed to remain in position for seven days. A gastro-enterostomy was not done, and all food by the mouth was withheld for several days. After removal of the tampon there was no escape of stomach contents from the opening, which later healed. In another case with perforation of a duodenal ulcer, operation was done fourteen hours after perforation. A long oval opening was found on the anterior surface of the duodenum,

about 4 cm. from the pylorus and admitting the index finger. After removing 2 to 5 mm. of the irregular, boggy margins, the opening was closed by a suture including the whole thickness of the bowel. A carefully placed turning in suture including one layer, was employed. The healing was good and there was no fever for a week, although the patient developed a complicating pneumonia. A gastro-enterostomy which was regarded as desirable was not done because the patient, an old man, was threatened with collapse during the operation. An intravenous, adrenalin-digalen-saline solution proved to be a life saving procedure. A long oval ulcer was excised from the anterior stomach wall and lesser curvature in a case of perforation of an apparently old, very callus ulcer, which came to operation on the third day after perforation. The excision was relatively simple with the application of two Doyen's clamps. The operation lasted over an hour and a half, too long for the severely collapsed patient. Death occurred two days later from peritonitis and exhaustion. The autopsy showed that the stomach contents did not escape, although the ulcer excision was not complete. In a case of pyloric ulcer in a man aged thirty-five years, admitted on the third day with a severe peritonitis and a history which pointed positively to a perforation of a gastric ulcer, operation showed the perforated ulcer at the pylorus on the anterior wall. A suture would have completely stenosed the pylorus and a gastro-enterostomy was indispensable. The perforation was covered over with a portion of the great omentum by a purse string suture and the site tamponned. The peritonitis was treated in the usual manner. The tampon was removed five days later but there was no escape of stomach contents. As Hoffmann maintained the treatment of perforated gastric and duodenal ulcers is not uniform but must be adapted to the individual case.

Surgery of Horse-shoe Kidney.—Botez (*Jour. d' Urolog. Med. et Chir.*, 1912, i, 625) says that the horse-shoe kidney is an anomaly which is found in the proportion of 1 per cent. in 715 autopsies and 1 per cent. in 143 operations. Although the non-diseased horse-shoe kidney is an anomaly which in the majority of cases, does not reveal itself during life, yet it may at times be the cause of various physical or psychic troubles. The morbidity is great enough (16.25 per cent.) to show a predisposition to contract different diseases. All the diseases of normal kidneys have been observed in horse-shoe kidneys. A healthy horse-shoe kidney giving trouble reveals itself especially by functional symptoms; pain, digestive and nervous disturbances, which constitute a true syndrome, that of horse-shoe kidney. The physical symptoms and especially palpation can render the diagnosis more or less probable. When a horse-shoe kidney is diseased the diagnosis will be made especially by palpation and radiography. A principal characteristic will be the median position of the mass or of the calculus if present in the kidney. The treatment of a healthy horse-shoe kidney giving trouble is always operative. The ideal operation is a complete division of the isthmus, that is, the transformation of the two fused kidneys into two separate kidneys. The treatment of a diseased horse-shoe kidney is only that of the diseased kidney. Each part of the kidney can be exposed by an extraperitoneal, lumbar, incision.

Because of the depth of the lobes and its more abundant vascularization, any operation employed ought to be modified in its technique and sometimes in its indications. With some restrictions and modifications of technique all renal operations can be practised on a horse-shoe kidney.

Hydrarthosis in a Horse-shoe Kidney.—GRÉGOIRE (*Jour. d' Urolog. Med. et Chir.*, 1912, i, 659) reports a case in which the symptoms were referred to the urinary tract and a rather voluminous tumor could be palpated in the right flank. Anteriorly near the median line a smaller mass was felt surmounting the large tumor. Operation was done through a right lateral incision. After freeing the peritoneum posteriorly, a large and slightly movable kidney was exposed. On continuing the separation of the peritoneum, it was found that the inferior pole of this kidney was continuous without interruption with the inferior pole of the left kidney, showing the presence of a horse-shoe kidney. In the concavity of the fused kidney was seen the second tumor which had been palpated before operation near the median line and which was formed by the markedly distended pelvis, prominent anteriorly. All the vessels of the renal pedicle were posterior to the pelvis. The ureter came from the internal border of the pelvis, and directed itself downward and posterior, in such a way as to produce a sharp curve at its upper extremity. The ureter was firmly adherent to the uniting pole of the kidney. It was freed and its direction rectified. Immediately the retention disappeared with great ease. The ureter was then fixed in good position by two or three fine, silk sutures to the capsule of the anterior surface of the horse-shoe kidney. The kidney was raised, slightly increasing the angle made at the origin of the ureter. The convex border was then fixed to the twelfth rib and abdominal wall by a few sutures. Healing was without incident. Three months later the patient was entirely well and had had no pain in the affected side since the operation.

The Experimental Production of Basedow's Disease.—KLOSE and LAMPE (*Zentralbl. f. Chir.*, 1912, xxxix, 641) say that in a previously published extensive work they have established that the intravenous introduction into dogs of very small quantities of the fluid pressed from an exophthalmic goitre can lead to the production of Basedow's disease, while large quantities of a similar fluid from the usual simple goitres will be without effect. They therefore regard this disease as a disthyroidism. Baruch's work supported the idea that it was a hyperthyroidism, because he produced what he regarded as the clinical picture, from intraperitoneal injections in different animals of crushed portions of simple and colloid goitres. He held that little or none of the substance producing the disease, is to be found in the fluid pressed from the gland. Klose and Lampe maintain that such fluids represent the concentrated cell contents and the classical form of biological experimental material. The material obtained from the crushing of the gland is a mixture of intact cells, which in an organism becomes effective only after the cell contents have been released by ferments. The resorption, therefore, is much slower than when the cell-free fluids are employed. The following objections are made against Baruch's

results: To be convincing the clinical results must be obtained after a single injection of the material employed as in their experiments. Baruch obtained the clinical picture described by him, usually after repeated injections.

Orthopedic Resection of the Pelvis of the Kidney for Hydrarthrosis, with Intermittent Crises.—GAYET (*Jour. d' Urolog. Med. et Chir.*, 1912, i, 625) says that the operation consists in removing a part of the pouch of the pelvis in order to bring the dimensions as much as possible to the normal. Albarran published the first case in 1898, although Kümmel had performed the operation in 1896, but did not publish the case until several years later. Gayet did the operation in 1910 with very good results. He was able to follow his case and very recently, two years after operation, he made a complete examination of the urinary tract. The patient had suffered in the right kidney for eight years, presenting for four years painful crises with renal distention, repeated once or twice each month. The treatment consisted in a nephropexy and orthopedic resection of the pelvis. At the examination more than two years later, no distention was found. The patient was completely relieved for five months, but for four months she has been suffering from slight pains in the two lumbar regions. the presence of a rectal ulceration and a certain degree of emaciation, makes one think of tuberculosis. But this is combatted by the negative inoculations, limpidity of the urine, and the absence of bacilli and albumin. The late result of the operation may be considered good, especially from the point of view of the regular emptying of the pelvis and the functional capacity of the kidney. According to Michel the operation has been done eight times, Gayet's making the ninth:

Surgical Pathology of the Stomach and Duodenum.—BINNIE (*Surg., Gynec., and Obst.*, 1912, xiv, 446) found that wounds of the stomach heal well; that the stomach is wonderfully tolerant of foreign bodies; that hemorrhages occur without demonstrable lesions; and that hemorrhage, erosion, and ulcers can be produced by toxins in the circulation. Binnie also observed that acids favor, but do not cause, ulceration in the stomach, duodenum, and jejunum. That local anemia (injections suprarenin) can produce ulcers; that stimulation and section of the vagus can produce ulceration; that in the latter the ulcers persist, provided that the musculature of the stomach is not impaired; and that retrograde embolism into the gastric veins can produce hemorrhage and ulcer of the stomach. The one common factor present in all the experiments or observations made regarding the incidence of ulcus ventriculi is vascular change or injury.

Observation on the Radical Cure of Hernia.—NASSAU (*Ann. of Surg.*, 1912, lv, 857), in discussing the choice of an anesthetic, says that in children up to the age of sixteen or seventeen years and in neurotic individuals, some form of general anesthesia is as yet the necessary evil. In youg adults, in the aged, and in all strangulated herniæ, except in children, he believes that general anesthesia should be avoided as far as possible and follows the method of operating under local anesthesia as laid down by Mitchell. The infiltrating solution

is made in two strengths. The strong solution is made by dissolving a hypodermic tablet containing $\frac{3}{4}$ grain of cocaine and $\frac{1}{100}$ grain adrenalin in 50 c.c. of normal salt solution. The weak solution contains the same strength tablet in 100 c.c. of salt solution. These tablets should be sterilized in very small cotton stoppered vials with dry heat, raising the temperature gradually during one hour to 100° C. Only two tablets are sterilized in each vial and they should be placed in cotton to avoid contact with glass. After experimenting with various syringes the best has been found to be the Record of 2 c.c. capacity. The patient's general nervous sensibilities are usually less on edge if a hypodermic injection of $\frac{1}{4}$ grain of morphine is administered a few moments before operation is begun. The essential points of the operation are: (1) Careful skin infiltration (strong solution); (2) perfect blocking of the iliohypogastric and ilioinguinal nerves (strong solution); (3) avoiding any unnecessary handling of tissues; (4) absolute prohibition as to gauze dissection; (5) forewarning patient that at this or that point some discomfort may be felt for a moment until a fresh infiltration with the weaker solution can be made. The post-operative course of a patient operated upon under infiltration anesthesia is so much more comfortable than with the use of ether that it is hard to institute comparisons.

An Experimental Contribution to the Formation of Arterial Capillaries in the Kidneys.—Isobe (*Mitt. a. d. Grenzgeb. d. Med. u. Chir.*, 1912, xxiv, 821) conducted experiments on rabbits and dogs to determine the formation of arterial collateral branches after implantation of omentum into the nephrotomized kidneys and after surrounding the decapsulated kidneys with omentum. The normal and hilum collateral capillaries of the kidney are very inconsiderable, so that after ligation of the chief trunks of the hilum vessels, the whole kidney substance was destroyed, as a rule. Only exceptionally were isolated portions of the urinary canal and a few injected capillaries preserved in the subcortical zone, in the border region between the cortical and medullary substance, and in the region of the hilum. In the kidneys which were decapsulated and surrounded by omentum, the capsule collateral vessels were more distinctly developed than in the normal. After ligation of the renal artery, a number of atrophied urinary canals and numerous injected vessels in the cortex, were found preserved. No glomeruli were found injected. By nephrotomy and implantation of omentum, collateral anastomoses in a very considerable degree, were formed, although not in a sufficient degree to take the place of the vessels of the hilum entirely. In this way it was found that after ligation of the renal artery, on both sides of the implanted omentum, in a zone about 0.2 to 1.0 cm. wide, the kidney substance was preserved and in it numerous vessels were injected. Many urinary canals were preserved continuously from the glomeruli to the papillary ducts with many well injected glomeruli. The injection of the glomeruli and the preservation of the urinary canals in their whole length never were found in the kidneys surrounded by omentum. Much less effective was the simple nephrotomy, without omental implantation, since the kidney wound healed with a linear scar and no noteworthy vessel anastomoses. Therefore, in chronic interstitial nephritis, the preferable operation is the nephrotomy with implantation of omentum. If the

general condition of the patient is bad, the preferable method is the surrounding of the decapsulated and scarified or simply decapsulated kidney, surrounded with omentum. Isobe recommends as the best method of all; scarification, nephrotomy, omental implantation, and complete surrounding of the bared kidney with omentum.

Duodeno-jejunal Occlusion as a Separate Condition. — BIRCHER (*Zentralbl. f. Chir.*, 1912, xxxix, 843) says that in the last year he has had a few opportunities of observing, after the most varied operations, that much feared postoperative, acute dilatation of the stomach, which when untreated is surely fatal, but which with Schnitzler's treatment, by the employment of the knee-elbow position, washing out of the stomach, and the injection of hormonal, were cured. He has also observed 3 cases in which an exactly analogous clinical picture, occurred independently and spontaneously. In the first patient, who was suffering from uncontrollable vomiting after a dietetic error, a diagnosis of a high ileus from hernia, was made. At operation the stomach was found much distended. As soon as the stomach and transverse colon were elevated and the duodenum exposed, the latter was seen to be distended to the size of a man's arm, and the distention reached to the duodeno-jejunal flexure. From there down the jejunum and ileum were completely collapsed and empty. The occlusion at the flexure being removed by the finger, gas immediately passed into the jejunum with a rumbling sound and the distended duodenum collapsed. As a prophylactic measure, a posterior, retrocolic gastro-enterostomy was performed. The patient recovered and was relieved of all symptoms. In the second case, the patient was admitted to the hospital with a much distended abdomen and in an unconscious condition. The diagnosis of peritonitis from a perforated gastric ulcer was made, but operation showed the same picture as in the first case, except that it was complicated by a duodenal ulcer and gallstones. The origin of the condition is still not understood. Bircher has since seen 3 other cases and finds that the condition may follow a more chronic course, but with remissions from time to time of acute symptoms. Operation showed regularly the usual distended duodenum with a stomach of usual size, while the jejunum and ileum were completely collapsed.

THERAPEUTICS

UNDER THE CHARGE OF

SAMUEL W. LAMBERT, M.D.,

PROFESSOR OF APPLIED THERAPEUTICS IN THE COLLEGE OF PHYSICIANS AND SURGEONS, COLUMBIA UNIVERSITY, NEW YORK.

The Effects of Pressure Lowering Drugs and Therapeutic Measures on Systolic and Diastolic Pressure in Man.—LAWRENCE (*Arch. of Int. Med.*, 1912, ix, 409) says that recent investigations indicate that

the pulse pressure is an important factor in determining the efficiency of the circulation and is of more value in prognosis than the systolic pressure. He conducted blood pressure estimations in 20 patients with permanent hypertension—chiefly cardio-renal cases—all showing a continued systolic pressure of 180 mm. or over—to determine the effects of various pressure lowering agents on the diastolic pressure. The systolic pressure was first taken at the point where the pulse first appeared at the wrist after complete obliteration and the diastolic pressure then ascertained by the auscultatory method. Lawrence gives the results of the observation in charts and tables in his article and draws a number of conclusions from his work. Reduction of systolic pressure by the use of nitrites, venesection, hot air, or electricity, is accompanied by a fall of diastolic pressure amounting, as a rule, to approximately one-half of the systolic fall. Such a reduction produces a coefficient of pressure more nearly approaching the normal than that pervailing in conditions of hypertension. Sodium nitrite reduces diastolic pressure more rapidly than the more complex compounds, thus causing a shorter initial diminution of pulse pressure than mannitol or erythrol. The effect on the pulse is more marked than that of the other drugs, the duration of its action is slightly less. None of the nitrite group is efficient for maintaining a pressure at a permanently lowered level as a tolerance is soon required, and increasing the dose is apt to cause unpleasant symptoms. Venesection has a more lasting effect in lowering the pressure than have any of the drugs used by Lawrence. The diastolic pressure is depressed longer than the systolic, the pulse pressure thus being increased. The effect of hot air baths, electric light baths, and high frequency currents is uncertain; a fall in pressure, if produced is transient. Vasotonin is not certain in its action and is not safe to use in cases showing marked hypertension, an increase of which might bring about untoward results. In each of the 5 cases, in which this agent was used, it caused a rise in both the systolic and diastolic pressures, in one instance accompanied by a severe anginal attack and in another by marked vertigo. He adds that in cases with permanent hypertension the effect on renal function of lowering the general pressure is an important and interesting point which will be discussed in a later paper.

The Treatment of Scarlet Fever with Injections of Serum from Convalescents.—Reiss and Jungmaun (*Deutsch. Archiv f. klin. Med.*, 1912, cvi, 70) report 12 cases of severe scarlet fever treated by injections of blood serum obtained from patients convalescing from scarlet fever. They injected from 40 c.c. to 100 c.c. of mixed serum from several scarlet fever convalescents intravenously. The disease was unusually severe in each case treated and the authors attributed the marked improvement in the general condition of these patients entirely to the injection. The temperature dropped 3° C. in from nine to fourteen hours with a corresponding drop in the pulse rate. The treatment seemed to have no effect at all upon local lesions in the throat, lymph nodes, or joints. This fact is regarded by the authors as proof of the specific action of the serum, as fever and general condition improved so markedly, notwithstanding the persistence or a definite increase in local inflammatory processes. The fever terminated by crisis in 10 of

the cases treated by serum while this occurred in only 2 cases out of 200 not treated by the serum. The patients treated by the serum all convalesced more quickly than the untreated cases. The authors believe that this treatment must be applied early in the course of the disease to be effectual. The serum should be from convalescent cases at about the eighteenth to the twenty-fourth day of the disease. The mixed serum from at least 1 patient should be tested before injection by inoculation and for the Wassermann reaction. For the sake of convenience they put it in anpoules each containing 50 c.c. of the serum to which five drops of a 5 per cent. carbolic acid are added.

The Secondary Effects of Harmonal.—Hesse (*Deutsch. med. Woch.*, 1912, xxxviii, 643) reviews the literation on the use of harmonal and gives in detail a case where the intravenous injection of 20 c.c. of harmonal was followed by severe collapse. His warning is valuable in view of the fact that harmonal is being widely used in post operative cases where there is abdominal distention due to deficient intestinal peristalsis. Hesse believes that harmonal has a marked depressant action upon the blood pressure and he therefore recommends that the blood pressure should be ascertained in every patient before administering the remedy. If the blood pressure is low, it should be considered a contraindication to the use of harmonal. He also suggests that adrenalin should be administered at the same time with harmonal in order to guard against a possible fall in blood pressure. In the case reported by Hesse the injection of harmonal had the desired effect upon the bowels, but he would recommend harmonal only in the most urgent cases because of its marked depressing action upon the circulation.

The Hypodermic Injections of Iron and Arsenic in Secondary Anemia.—Musser (*Boston Med. and Surg. Jour.*, 1912, clxvi, 775) reports a number of cases of secondary anemia treated by hypodermic injections of iron and arsenic. The hypodermic use of iron has been advocated particularly by Italian observers and the preparations used by them seem to be far better borne than similar preparations made in this country. Musser tried a solution of ferric citrate made in this country but the results obtained by its use were very unsatisfactory. The injection of this ferric citrate solution in doses sufficiently large to give therapeutic results were painful and caused considerable local irritation. In a few cases attacks of vertigo, fainting, and vomiting followed the injections. Musser then tried a combination of iron and arsenic of each 0.06 gram, and sodium glycerophosphate 0.10 gram dissolved in 1 c.c. of distilled water. The resultant solution is placed in small glass ampoules, sterilized, and is ready for instant injection. The solution is free from irritating qualities and may be injected into the muscles of the thigh or into the deltoid muscle. The injections were given, as a rule, twice a week, though in some cases as often as one a day was given for a short time. In several cases the injections were only given once a week. Musser believes this method of procedure is entirely practical in office and dispensary work and that it is a valuable adjunct to the treatment of anemia, secondary to some relatively mild condition. He says that it affords a method of giving the drugs

in which the exact amount taken is accurately known, and that it does away with the annoying complications that frequently result from the administration of the drugs by mouth. Of 14 cases treated in this manner only 1 failed to improve promptly. He also notes the marked benefit derived from this treatment in a case of pernicious anemia where the hemaglobin rose from 19 per cent. to 68 per cent. and the number of red blood cells increased from 950,000 to 3,490,000.

Neosalvarsan. — SCHREIBER (*Münch. med. Woch.*, 1912, lix, 905) writes concerning neosalvarsan which is a product closely related to salvarsan but having a number of advantages over the older drug. It was prepared by Ehrlich and has been given by Schreiber about 1200 times to 230 patients with no untoward effects. Neosalvarsan is very readily soluble in water and the solutions for injections should be made just before using in freshly distilled water. The reaction of the solution is absolutely neutral and therefore does not require neutralization with normal soda solution. Neosalvarsan was found to be much less toxic in the experiments on animals, and therefore Schreiber believes that it can be given in larger doses than salvarsan. He also believes that it is at least as effective as salvarsan in its therapeutic action. Untoward by-effects were not observed as frequently as after salvarsan. Finally, neosalvarsan is more suitable for intramuscular injection than is salvarsan. When given intramuscularly neosalvarsan does not give rise to the burning pain caused by salvarsan nor does it cause dense infiltrations at the site of injection.

By-effects of Harmonal. — ROSENKRANTZ (*Münch. med. Woch.*, 1912, lix, 931) reports a case where symptoms resembling those of air embolism came on during the intravenous injection of 10 c.c. of harmonal. The injection was given two days after a second laparotomy to break up adhesions that had formed nineteen days after an appendectomy. The patient gasped for breath, complained that his head felt as if it were bursting, face was drawn, and eyes fixed. These symptoms gradually subsided but were very alarming at the time. About seven hours after the injection an enema was followed by the passage of a stool and considerable flatus.

The Treatment of Acute Endocarditis due to Streptococcus Viridans.—TOREY (*Münch. med. Woch.*, 1912, lix, 971) reports 2 cases of malignant endocarditis in which blood cultures showed the presence of streptococcus viridans. This organism produces a subacute but extremely fatal form of endocarditis. One of these cases recovered after the intravenous injection of salvarsan and the improvement seemed to Torey to be due to injections. Torey has tried a great variety of other methods of treatment in cases of this type without success, and, although in other similar cases salvarsan has not been successful, he believes that a trail of this remedy is justifiable in all cases of malignant endocarditis.

The Serum Treatment of Typhoid Fever.—LUDKE (*Münch. med. Woch.*, 1912, lix, 907) advocates a new serum treatment of typhoid fever that theoretically rests upon a rational basis. He describes his method

of preparing the serum, which has both anti-toxin and bactericidal properties and gives in detail animal experiments that seem to indicate that the serum has an antogonistic action toward typhoid bacillus infections. He reports his clinical observations in 29 cases of typhoid fever treated with this serum. No deaths occurred in this series of cases and complications seemed to be much less frequent than in cases not under this treatment but otherwise under similar conditions. The serum must be injected early in the course of the disease. It seemed to have the most pronounced beneficial effect when it was given before the twelfth day of the disease. The temperature came down rapidly by lysis and the patients were convalescent in a few days. When the serum was given in the later stages of the disease it was not so clearly manifest that the course of the disease was shortened although symptoms, particularly the fever, were often much improved. To be effectual the injections should preferably be intravenous or intramuscular, either a single large injection or several repeated injections of smaller amounts.

Untoward By-effects of Harmonal.—Frischberg (*Münch. med. Woch.*, 1912, lix, 990) reports a case where the injection of 20 c.c. of harmonal was followed by marked symptoms of collapse. This patient had a severe chill, lasting thirty minutes, followed by a rise of temperature to 105.8° F. During the chill the pulse became feeble, the face was slightly cyanotic, and the patient complained of intense headache. The injection was given on the fourth day after an operation for chronic appendicitis because of enormous abdominal distention and obstipation. The harmonal injection was apparently very effectual, as the patient passed flatus during the chill, followed in a few hours by a copious bowel movement with relief to the abdominal distention.

The Treatment of Tetanus with Magnesium Sulphate.—Parker (*Jour. Amer. Med. Assoc.*, 1912, lviii, 1746) reports in detail 3 cases of severe tetanus successfully treated by subcutaneous injections of magnesium sulphate. Parker says that the dosage recommended for intraspinal injection is 1 c.c. of a 25 per cent. solution for every 20 pounds of body weight. The dosage used in the cases treated by Parker was much larger and no ill effects were observed. Two of these cases were acute and severe, not fulminant, but belonging to the class from which one would expect a high mortality. The prompt relaxation resulting after the injections certainty shows that magnesium sulphate is of value in the treatment of tetanus. It has no specific action, but by quieting the excessive muscular action it permits the patient to obtain more rest and to take food and thus tides him over while he is manufacturing his own antitoxin. Parker calls attention to the fact that there are some dangers in the use of magnesium sulphate, as it has been shown that it often produces toxic effects, chief among which are depression of respiratory and cardiac centres. It has recently been proved, by Joseph and Meltzer of the Rockefeller Institute, that physostigmin antagonizes the toxic respiratory depression sometimes caused by magnesium. Parker says that it is well to bear this in mind, as it may be the means of saving life.

PEDIATRICS

UNDER THE CHARGE OF

LOUIS STARR, M.D., AND THOMPSON S. WESTCOTT, M.D.,

OF PHILADELPHIA.

The Use of Salvarsan in Hereditary Syphilis.—EUG. AUDRONESCU (*Deutsch. med. Woch.*, 1912, xxxviii, 761) reports excellent results with salvarsan in the treatment of hereditary syphilis in infants and children. This remedy may be used indirectly by injecting it into the mother who nurses a syphilitic child, or directly, in which case the child is given the injection directly into its own tissues. Audronescu used the indirect method with the best results in three infants, aged three months, three and a half months, and one year and three months respectively. The adult dose was given the mother and within a short time an entire cure of the syphiltic lesions occurred in the first two children. The third child, with optic atrophy following pertussis, was unaffected by the salvarsan, the atrophy having probably no syphilitic origin. The direct injection of salvarsan in infants has been held by many to be too dangerous for routine use. Audronescu, however, used it in 6 consecutive cases, with excellent results in 4 of them. The age of the children varied from two weeks to four and a half years. The dosage varied according to age, from 0.02 gram to 0.12 gram of salvarsan. Three of the cases were completely cured, one was greatly improved, one with hydrocephalus, icterus, and nephritis was unimproved. The last case, an infant aged two weeks, with a bullous eruption and superficial abscesses, was given 0.02 gram salvarsan as it was not thought possible it could recover. The treatment resulted in a surprising and marked improvement in the child's condition. Audronescu considers these cases very significant as showing the harmlessness of the direct injection method in children and also the remarkable curative effects. He believes that salvarsan should always be tried out in children with hereditary lues as it offers often the only possibility of cure. The usual treatment with mercury either by intermuscular injection, or inunction, or by mouth had no effect whatever on the cases noted above.

The Treatment of Acute Spastic Bronchitis in Early Childhood.—F. GÖPPERT (*Berlin. klin. Woch.*, 1912, xlix, 791) defines spastic bronchitis as a symptom complex similar to the asthma of later life. Von Comby refers to it as asthma in infancy. Czerny defines spastic bronchitis as a typical manifestation of the exudative diathesis. All the cases seen by Göppert have shown marked evidences of exudative diathesis. After a slight irritation of the upper air passages for several days the attack begins suddenly with sharp dyspnea and inflation of the lungs. The child exhibits intense restlessness and often cries out continually in suffocated tones. At the moment of onset the child becomes cold and deathly pale. The skin becomes cyanotic only in

children under four months of age. Every inspiration is labored and the expression is one of terror. The body temperature is variable, being sometimes high and again normal. After twenty-four to forty-eight hours the attack subsides leaving a bronchitis more or less severe which usually causes no serious trouble in children aged over six months. There exists in this condition, as in asthma, a apasm of the bronchial musculature, constriction of the superficial bloodvessels, and dilatation of the vessels of the splanchnic system. The first indication in treatment is to quiet the intense restlessness. Göppert, until recently, used chloral by bowel in small doses, which induces sleep, makes the respiration easier, and mitigates the condition when the child awakes. This treatment, however, is dangerous for children aged under four months, and in these cases Göppert first tried urethan in 0.5 gram doses with very good results. The subsequent trials with urethan showed that it was perfectly safe and very effective and so it supplanted the chloral in the treatment of these cases. Urethan is given by month in doses of 1 to 2 grams and causes a light sleep for one or two hours, followed by great improvement in the respiration, pallor, and distress, and occasionally by the entire disappearance of all the acute symptoms. This proves urethan to have an antispasmodic effect on the bronchial musculature. H. Meyer has also advised the use of urethan in the asthma of adults. In infants the dose must be sufficiently large. In the first three months the dose by mouth is 0.5 gram, 1.5 grams later on during the first year, and 2 grams for the second year of life. By rectum the dose is doubled. The dose may be repeated within forty-five minutes if necessary. These doses may be given with safety even though there be existing cardiac disease or bronchopneumonia. In the latter disease the condition at times becomes worse with increased restlessness as if spasm of the bronchial tubes here also played a part, although the restlessness is comparatively less in proportion to the respirations. In such conditions urethan has proved useful, and the degree of its effect tends to indicate whether the change for the worse is due to an element of bronchial spasm or to an anatomical progression of the disease.

Studies in the Nutrition and Digestion of Infants.—MAYNARD LADD (*Archives of Pediatrics*, 1912, xxix, 324) presents a clinical study of 82 cases of indigestion and malnutrition in infants, illustrating the results gained by adapting milk to individual requirements and the relative value of different types of food in substitute feeding. Much misconception of the American system of feeding is due to the rules for feeding normal infants given in text-books. These rules are no guide for the sick or badly nourished children in whom great variation in food requirements are found. Individual factors in every case modify the treatment and must be learned by observation and experimentation. Infantile atrophy or marasmus presents the most interesting of all difficult feeding cases. The majority of these cases are due to long-continued improper feeding. This may be due to an insufficient breast milk, an excessively strong, or an excessively weak modified milk. The overfed cases present the greatest difficulties from greater gastric intolerance. The statement that these cases will not tolerate

fat is often taken too literally, as a tolerance for fats may often be established by giving a very low fat percentage for a considerable time and gradually increasing it. Ladd emphasizes two essential points. One is that the pecrentage of one element pushed beyond the child's digestive ability unfavorably affects the digestion of all the other elements. The second is, that if one element, such as fat, is kept very low; much higher percentages of the other elements can be given. The digestibility of fat depends largely on the character of the carbohydrates and the exhibition of casein in an easily digestible form. The regulation of the quantity of each feeding, the intervals between, and the number of feedings are equally as important as the percentage composition. Ladd speaks highly of the "eiweismilch" of Finkelstein and Meyer who believe that the whey constituents of cow's milk cause its indigestibility. This mixture is given in cases of diarrhea with good results, but the inconvenience of its preparation is an objection. Much of the feeling against fats arises from three causes. These are too rapid increase of fat percentages, errors in the composition of formulæ, and insufficient quantities of lime to saponify the fatty acids. In Ladd's studies of 82 cases it was found that the addition of malt sugar to whey mixtures instead of milk sugar increases the rate of gain in weight. There were no deleterious effects from a prolonged use of whey elements. The use of malt preparations with barley exceeded in efficiency the plain cream mixtures and the plain whey mixtures with milk sugar. Superheating the milk in malt mixtures neither increased nor diminished the nutritive value. Many babies today are being underfed in fat percentages. The danger of scorbutus in superheated malt mixtures is minimized by the daily administration of small doses of orange juice.

Inclusion Bodies in the Blood in Scarlet Fever.—Matthias Nicoll and Anna Williams (*Archives of Pediatrics*, 1912, xxix, 350) studied blood smears from 51 cases of scarlet fever and 25 control cases to test out the finding of inclusion bodies reported by Professor Dohle, of Kiel, and Martin Kretschmar, of Strassburg. Dohle, in 30 cases of scarlet fever blood, found inclusion bodies in the polymorphonuclear leukocytes in almost every case. By various staining methods they could easily be differentiated from the nuclear substance. Inclusion bodies were found in but 3 out of a large number of control cases. These were found in pneumonia and carcinoma. Kretschmar confirmed the findings of Dohle, having found the inclusion bodies in all of 30 cases examined. In 70 controls the bodies were found in only 3 cases—one of pneumonia and two in diphtheria with streptococcus empyema. Loeffler's or Mauson's stains are recommended as simple and efficient. Nicoll and Williams have to date studied blood smears from 51 cases of scarlet fever, finding the inclusion bodies described by Dohle in 45 cases, 6 cases failing to show them. The negative cases all had been ill for eight days or more. The positive cases had been ill less than a week, most of them less than four days. The inclusions consisted of small coccus and bacillary forms. In 24 control cases the bodies were found in 3 instances—1 of pneumonia, 1 of erysipelas, and 1 of measles with complications. The last case developed scarlatiniform rash and sore throat which was not diagnosticated as scarlet fever by the Board

of Health. Nicoll and Williams feel justified in believing that a blood examination in the first week of the disease will serve to differentiate scarlet fever from measles, German measles, and probably toxic eruptions. Differentiation from eruptions in sepsis, influenza, and tonsillitis must be determined by further study.

OBSTETRICS

UNDER THE CHARGE OF

EDWARD P. DAVIS, A.M., M.D.,

PROFESSOR OF OBSTETRICS IN THE JEFFERSON MEDICAL COLLEGE, PHILADELPHIA.

The Diagnosis of the Pernicious Nausea of Pregnancy.—INGRAHAM (*Jour. Amer. Med. Assoc.*, February 6, 1912), in a paper in which he reviews the recent literature of pernicious nausea, draws attention to the value of the thorough administration of dextrose by enemas as an indication of insufficient formation of urea. By using definite quantities of sugar alimentary glycosuria may be produced to determine the impairment of the liver and the disturbance of the glycogenic function. In operative interference in the toxemias of pregnancy, chloroform is dangerous and contraindicated. Extracts of the ductless glands should be given a thorough trial.

The Needless Interruption of Maternal Nursing.—KOPLIK (*Jour. Amer. Med. Assoc.*, January 13, 1912), in a paper on the "Nursing Infant," found that in 1007 infants, but 124 were entirely breast-fed, or 12 per cent.; 573, or 56 per cent., were breast and bottle fed babies while 28 per cent. were bottle-fed absolutely. Of those which were fed on the breast and on the bottle, 60 per cent. were put on the bottle at the fourth month, and the breast abandoned; and in only 20 per cent. of the breast-fed children was an attempt made from the start at mixed feeding, the practitioner abandoning the breast in the remaining cases, when for some reason the breast became insufficient. While it may frequently not be possible to have the infant entirely breast-fed, in these cases mixed feeding from the beginning will enable the mother to retain breast-feeding indefinitely, greatly to her advantage and the child's. Breast-feeding is too frequently abandoned for insufficient cause, and apparently mixed feeding is not considered as frequently as it should be.

Icterus Neonatorum.—HEIMANN (*Zeit. f. Geburts. u. Gynäk.*, 1911, Band lxix, Heft 1) has studied the blood of infants in varying degrees of icterus to determine the cause of this condition. He finds that these children do not differ from other children in weight, temperature, or the character of the fecal discharges. He considers the condition of icterus to be one of the blood, and largely dependent upon the fact that the child does not assimilate sufficient albuminoid food.

When this condition is present it begins to digest its own tissues, and first its blood corpuscles. As these consist largely of nucleo-albumin, their dissolution leaves hemoglobin in solution, whose apsorption occasions icterus. The duodenal catarrh present in these cases is merely an accompaniment and not an essential factor.

Parturition during Adolescence.—Bondy (*Zeit. f. Geburts. u. Gynäk.*, 1911, Band lxix, Heft 1) publishes an elaborate paper upon this subject, based upon the examination of 1000 primiparous patients aged between fourteen and twenty-seven years. His investigations show that the belief often expressed that a patient should not give birth to children until after the twentieth year, is not correct. His investigations would indicate that the most favorable period for the first parturition is between the eighteenth and twentieth years. So far as the performance of the physiological functions is concerned, the period would be between the eighteenth and twenty-third years. After this time the conditions become rapidly less favorable for mother and child. Between the ages of fourteen and seventeen years, successful parturition, with healthy children, is by no means uncommon, and this cannot be considered an unfavorable peirod for mother and child.

Sugar in the Blood in Pregnancy, Labor, the Puerperal State, and Eclampsia.—Benthin (*Zeit. f. Geburts. u. Gynäk.*, 1911, Band lxix, Heft 1) finds that the quantity of sugar in the blood increases during labor, especially in the expulsive period, afterward diminishing during the puerperal state. In some cases this increase is inconsiderable, while in others it is so noticeable as to constitute a marked phenomenon. In eclampsia a very large increase is observed. In labor muscular activity must be assigned as an essential cause, although no parallel can be drawn between the length of labor and the quantity of sugar. The violence of muscular contraction seems to be an important factor, which is demonstrable in cases of eclampsia, although here a toxic element is also present. Pregnant women with chronic nephritis and high pulse tension have an increased quantity of sugar, but other cases of nephritis often show less than the average. In patients observed by the writer, the pulse tension was not above 145 mm. Benthin describes the case of a patient coming under observation five weeks before labor, suffering from the nephritis of pregnancy. Early in the disease considerable improvement had followed a strict limitation of diet. On admission to hospital, the urine contained 0.75 per cent. of albumin and 0.063 per cent. of blood sugar. The second examination made thirteen hours before labor, after parturition had been in progress fourteen hours, and just after the patient had had one eclamptic convusion, showed 12 per cent. albumin, and 0.097 per cent. blood sugar. On the eleventh day of the puerperal period the albumin was 2.5 per cent., the sugar 0.074 per cent. It was interesting to investigate the relation of the production of sugar to weak uterine contractions, uterine atony, and the convulsions of epilepsy, delirium tremens, and hysteria.

The Differential Diagnosis of Pregnancy.—Olshausen (*Zeit. f. Geburts. u. Gynäk.*, 1911, Band lxix, Heft 1) draws attention to the

difficulties in the differential diagnosis of pregnancy in the later months. He recalls the case of a patient fourteen years married, and not previously pregnant. Menstruation had been interrupted for several months. The abdomen increased rapidly in size and in weight, and in unfavorable sensations. On examination abdominal distention was greater than is normal at the end of gestation. Palpation was unsatisfactory. Under anesthesia three tumors of almost the same size could be made out in the abdomen and they were nearly ovoidal in shape. One was on the left side at the brim of the pelvis and apparently the pregnant uterus of between four and five months. The second was upon the right, just above the pelvis, while the lower extremity of this tumor filled the small pelvis. The third was entirely above the pelvis, and so high as to make pressure upon the diaphragm and produce dyspnea. In endeavoring to ascertain what these tumors were, the one in the pelvis from its consistence seemed to be a myoma, and apparently was subserous, with a pedicle. The one above this was diagnosticated as a subserous myoma. Upon operation, the diagnosis was found to be correct, and both myomas were removed. Pregnancy succeeded to a successful termination. Olshausen also draws attention to the difficulties in diagnosis, occasioned by hydramnios. Ovarian tumor may also occasion confusion, especially in cases where the amniotic liquid increases very rapidly. The great tension of the abdominal wall and the walls of the uterus, makes the diagnosis very difficult. Fluctuation is present in hydramnios, and it may be impossible to palpate the child. Lateral flexion of the pregnant uterus may also occasion confusion. This is sometimes mistaken for hypertrophy of the supravaginal portion of the cervix, and is most often seen in multiparæ. In these cases it is difficult to determine whether one is dealing with a flexed uterus or with a para-uterine tumor. An especially valuable method of examination in these cases consists in following up the lateral border of the uterus by palpation from the vaginal portion of the cervix. Olshausen holds with the majority of writers, that uncomplicated retroflexion in many cases is a serious matter in pregnancy. This is proved by the disappearance of symptoms when the abnormal position is altered.

Changes in the Symphysis and other Pelvic Joints in Parturient Patients.—Loeschke (*Archiv f. Gynäk.* Band xlvi, Heft 3, 1912) reports in a well illustrated paper his studies of the changes in the symphysis and other pelvic joints occurring in parturient women. He believes that the normal symphysis gives a complete union. The static relations of the pelvis are different in children and in adults, as in the adult the symphysis is much more strongly bound together than in the child. When changes occur in the symphysis which weaken it as a joint, they are usually of two kinds: One is the degeneration of its tissues, and the other the result of traumatic injury. In all labors the symphysis is considerably stretched. During parturition the symphysis is practically a movable joint. In each succeeding pregnancy the pelvis should increase slightly in size from the development of new bony tissue. In multiparæ this can often be seen at the symphysis. In every pregnancy the tissues about the symphysis are enlarged through the development of bony material. In multiparæ

one often observes an increase in the bone extending for more than 2 cm. The same change undoubtedly occurs in the sacro-iliac joints, and this process must be considered as a part of the general hypertrophy of pregnancy.

Pregnancy and Double Pyosalpinx.—GRADL (*Zentralb. f. Gynäk.*, 1912, No. 17) reports the case of a woman, aged twenty-two years, who complained of symptoms often described in cases suffering from chronic pelvic inflammation. The uterus was anteflexed, somewhat enlarged, and softened. Gonococci were found in great numbers. At operation the right tube was as large as a hen's egg, and the left the size of a large walnut. Both were adherent to the rectum. The uterus was edematous and swollen. It seemed impossible to remove the tumors without injuring the intestine, and as both tumors were draining into the rectum they were allowed to remain, and the abdomen was closed. On the fifth day after operation the patient complained of pain and discharged bloody pus through the bowel. She gradually improved and left the hospital. She returned some time afterward three months pregnant and suffering from great pain, and urging that the uterus be emptied. This was declined, and the patient left the hospital. She again returned after labor with her child, stating that she had had spontaneous labor, but had suffered great pain. The third stage of labor and the puerperal period had been normal. The child was vigorous and showed no evidence of gonococcic infection. The interesting question arises as to how the ovum could have passed into the uterus in the presence of double pyosalpinx.

Death of the Child from Rupture of the Umbilical Vessels during Labor.—WILLIAMSON (*Jour. of Obst. and Gynec. of the British Empire*, April, 1912) reports the case of a patient in her second labor, with a generally contracted pelvis. The child was small and could easily be made to enter the pelvis. The child was delivered by forceps, the mother having had slight hemorrhage with each pain. It was pale and bloodless, and the heart was not beating. On examining the placenta it was found to be of the velamentous type. The first vessel to leave the placenta was the umbilical artery, which had ruptured two inches from the insertion of the cord. Where the artery left the cord a large vein entered, which passed across the amniotic sac between the amnion and the chorion, thence over the fetal surface of the placenta, and into the placental substance. The vein was an aberrant vessel. On examination, the vein was thrombosed, except at a point near its entrance to the main umbilical vein, where it contained no thrombus. This vein had been compressed during labor and it became distended with coagulated blood. It ran close to the opening in the membranes, through which the child was born, and was evidently a vasa prævia. It was compressed between the presenting part of the uterine wall near its entrance to the main umbilical vein, for in that place only it contained no thrombus. As a result of compression the vein became distended with coagulated blood. During the second stage of labor, the membranes not rupturing at once, pressure ruptured the chorion and the vessel was torn across. A similar specimen had been recently sent to the Museum of St. Bartholomew's Hospital.

The clinical history of this case was that when the membranes ruptured there was a gush of blood, and afterward a little escaped with each pain. The child was spontaneously born, and was white and bloodless. On examining the placenta, a branch of the umbilical vein was torn across at the site of rupture of the membranes. From this vein the child had bled to death. Knapp's interesting case of twins, where both children bled to death from the rupture of a single vein, is cited. During labor diagnosis may sometimes be made by feeling the pulsating vessels running across the presenting portion of the membranes. The bleeding may be mistaken for placenta prævia or accidental hemorrhage. The mother, however, shows no signs of bleeding. The prognosis for the child in these cases is bad and it usually perishes from asphyxia. In some cases it may be possible to rupture the membranes at a point where there are no vessels, but this requires considerable dilatation of the birth-canal. Williamson believes that if a diagnosis can be made early in labor, before the vessel is ruptured, that the child should be delivered by section. After rupture the child is so weak from hemorrhage that no radical operation can be performed.

Ovarian Pregnancy.—Banks (*Jour. of Obst. and Gynec. of the British Empire*, April, 1912) reports the case of a multipara having a tender, doughy mass in Douglas' cul-de-sac to the right of the uterus. A diagnosis of extrauterine pregnancy was made, and at operation a small quantity of dark fluid blood was found free in the peritoneal cavity. The tumor comprised the ovary and tube, which was normal and free at both portions. Oöphorectomy was done, leaving a segment of ovary near the ovarian ligament. On examination, ovarian substance somewhat altered was found, with a darker spongy zone separating it from the membranes. The sac contined a fetus of eleven weeks. Microscopic study showed definite ovarian substance, with slight change in the vessels. Ovarian stroma could be traced to the point where the ovarian elements disappeared, the fibrillæ becoming compressed with a few thin-walled bloodvessels. A portion of the tumor was edematous and undoubtedly altered ovarian tissue, and in this trophoblastic masses could be identified. The chorion and amnion were found, the villi of the former being scanty and degenerated. A minute study of the specimen left no doubt but that it was an ovarian pregnancy.

The Treatment of Puerperal Sepsis By Cultures of Lactic Bacilli.—Brindeau (*Archiv. mensuelles l'Obstétrique*, March, 1912) reports his results in the treatment of 92 cases of the various forms of puerperal septic infection by cultures of the lactic bacillus. His results were favorable and indicated that this remedy increased the patient's leukocytosis and thus heightened her power of resistance. The remedy may be used freely, for it is not in itself poisonous. An active culture should be employed, the dose varying from 0.5 c.c. to 20 c.c. of milk containing the bacilli, at a temperature of 37° C. This method is successful in all cases of septic or putrid wounds about the genital tracts, and is especially valuable in vulvo-perineal ulcers following delivery. These surfaces cleaned rapidly after the treatment and were in good condition for a secondary operation for the repair of lacerations.

GYNECOLOGY

UNDER THE CHARGE OF

JOHN G. CLARK, M.D.,

PROFESSOR OF GYNECOLOGY IN THE UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA.

Ovarian Transplanation.—An extremely interesting case of successful heterotransplatation of an ovary, with relief of very severe symptoms following an artificial menopause of two years' standing, is reported by ENGEL (*Berlin. klin. Woch.*, 1912, xlix, 985). The patient, a twenty-seven year old nullipara, had been subjected to an appendectomy and ventro-suspension in 1904, and to a double oöphorectomy in 1909. The latter operation was followed by very severe disturbances—hot flashes, vomiting, violent attacks of abdominal pain, sweats, profuse and irregular uterine hemorrhages. In 1910, therefore, a supra-vaginal hysterectomy was performed by Engel. After this the hemorrhages ceased, but the general condition of the patient grew steadily worse; to the physical were added psychic disturbances, going so far as threats of suicide. The patient was therefore readmitted to the hospital in 1911, and a healthy ovary, obtained from another woman at a myoma operation, was transplanted onto the anterior wall of the cervical stump. Only a short time elasped between the two operations; during this time the ovary was kept in normal salt solution at body temperature. The operation was performed vaginally; a T-shaped incision was made in the anterior vaginal vault, the mucosa dissected to each side, and the ovary, split open, attached to the cervix with cat-gut sutures. The vaginal mucosa was then closed over the surface of the transplanted ovary. For eight days no effect whatever was noted; then the symptoms began to decrease in severity. By the seventh week after the operation the attacks of abdominal pain and sweats had entirely ceased; the other symptoms, such as hot flashes, etc., disappeared more gradually, but eventually entirely cleared up as well. The patient now enjoys the best of health, and has again taken up her work as a trained nurse. Engel believes that suggestion can be entirely eliminated as a factor in this case, as the first signs of improvement did not show themselves until eight days after the operation, and from then on progress was slow and gradual. For a time there was considerable watery discharge from the vagina, and grayish and whitish areas were to be seen on the surface of the ovary, but before the patient left the clinic the secretion had entirely disappeared, and the ovary appeared entirely healed.

Is Laparotomy Indicated in Peritoneal Tuberculosis?—HEIMANN (*Zeitsch. f. Geb. u. Gyn.*, 192, lxx, 159) says that although the Gynecologic Congress held in Munich in 1911 decided in favor of the operative therapy of peritoneal tuberculosis, his experience has led him to consider it inadvisable. His conclusions are based on the observation of 50 operated cases from the clinic of Zweifel (Leipzig) and Krönig

(Freiburg), 36 of these patients having been subsequently controlled for periods up to as long as ten years after operation. He divides his cases into two groups; (1) Those with practically no symptoms referable to peritoneal tuberculosis, the presence of this being discovered only at operation for sterility, retroversion, or some other condition. (2) Advanced cases, with marked symptoms, and objective findings in the lungs. All the patients in the first group were fully able to work before operation; of 18 whose fate could be ascertained from one-half to nine years later, only 7 were in possession of their full activity, while 4 had died, 2 of these as a direct result of the operation. These are results which cannot, as Heimann says, in any way be considered brilliant, especially when one considers that many of these patients would probably have undergone spontaneous cure if left alone. The results in 18 patients in the second class were even worse. Within one and a half years after operation 50 per cent. were dead, all either as a direct result of the operation, or from a general, progressive tuberculosis. Of the remaining 8, only 3 can be considered clinically cured, that is, able to do ordinary work. In most of the cases in this group the accompanying pulmonary tuberculosis was markedly and unfavorably influenced by the operation. Heimann concludes that in these cases the performance of a laparotomy has not fulfilled expectations; that the percentage of apparent cures stands in inverse ratio to the length of time after operation that cases are controlled; that the primary mortality is very high; and that in so many cases a lighting up of foci in the lungs or other organs results that laparotomy can no longer be considered a sovereign therapy for peritoneal tuberculosis. If it is to be employed at all, it should only be in cases of the serous, exudative form, and all severe cases, and all those with lung conditions or with fever should be excluded. Where operation becomes necessary to relieve pressure symptoms Heimann prefers to open the peritoneum through Douglas' pouch if possible, in order to avoid the possibility of a fecal fistula. If this is not possible, the smallest possible opening should be made through which the work to be done can be accomplished.

Spontaneous Cure of Cancer.—Theilhaber (*Deutsch. med. Woch.*, 1912, xxxviii, 1240) says that it can no longer be doubted that spontaneous cure of cancer does occasionally occur, about 200 such cases having been reported in the literature. He believes that a careful study of these may possibly throw some light on the principle by which this occurs, and may point out ways in which we can assist the process. He reports having observed recently 3 cases in which he believes a spontaneous cure of cancer had occurred. In all he had performed a complete hysterectomy for advanced malignancy, but had been unable to remove completely all the carcinomatous tissue. Contrary to his expectations, complete cure occurred in these patients, this having been demonstrated by recent examinations. The longest period elapsed since operation was seven years, the shortest four. Theilhaber futher reports 3 cases which have strengthened him in his well-known belief that after treatment by hyperemia, and other means which tend to improve tissue nourishment, may prevent and even destroy recurrences. The first case was that of an old woman, aged fifty-six years, with advanced, ulcerative carcinoma of the cervix, and extensive parametrial

involvement. After curettage and cauterization, treatment with hot air, hot douches, and hot sitz-baths was begun. In addition, an injection of 0.05 gm. sod. cacodylate was given every other day; five injections of 4 c.c. of uterine extract were also administered. By the end of the fifth month the cervix was completely cicatrized, and all discharge had ceased. The patient gained 3 to 4 pounds a month, and now feels well and strong. The other case was that of a woman with advanced mammary carcinoma. Four weeks after operation marked edema of the arm and a hard swelling in the axilla had developed. These disappeared under the application of Bier's hyperemia, and the patient was lost sight of. Several weeks later the edema and lump had returned, but disappeared again after two months more of treatment. This was kept up some time longer, and the patient remains well after one and three-fourths years. Theilhaber believes that free hemorrhage at the time of operation tends to favor a good circulation in the tissue subsequently, and goes so far as to advise the withdrawal by venesection of 400 to 500 c.c. of blood after incomplete carcinoma operations in order to stimulate this.

Treatment of Metritis.—The treatment of chronic metritis and endometritis by the intra-uterine instillation of zinc chloride solution, orginated some years ago by Prof. Delbet, is warmly advocated by two of his assistants, Mocquot and Mock (*Rev. de Chir.* 1912, xxxii, 779). For this purpose they employ a Braun syringe, with a very fine canula, so that the solution may flow back freely around it. After having determined with a sound the direction and extent of the uterine canal, the canula is inserted as far as it will go, and, gradually withdrawing it, 2 to 3 c.c. of a 5 per cent. cocaine or novocaine solution are injected, as the zinc solution causes considerable pain, unless the mucosa is thus anesthetized. After waiting five minutes, the canula is again introduced, and 1 to 2 c.c. of the zinc chloride solution injected in the same manner, the syringe being gradually rotated as the injection is being made Since the canula is supplied with small lateral openings near the tip, this assures a thorough distribution of the solution. In rare cases, where the endometrial cavity is very large, 3 c.c. of solution are employed, but this amount should never be exceeded. Solutions of two strengths are used; for cases of "glandular" or parenchymatous" metritis 30 per cent.; for the hemorrhagic form 40 per cent. After each injection the patient should remain lying down four or five hours, and may then return home. Mocquot and Moch consider this form of treatment far more efficacious than curettage, besides being much less of a procedure, never requiring a general anesthetic. While they have obtained marked benefit in all forms of metritis, some are, as a rule, more favorably influenced than others, especially the hemorrhagic forms, and cases following abortion. Where the adnexa are involved the results are, as a rule, less satisfactory. In about 4 per cent. of the cases thus treated very severe abdominal pains come on from one-quarter to one hour after the injection, and may last for several hours. It is impossible to tell beforehand in which cases these will occur; they may be accompanied by vomiting and syncopal attacks. Mocquot and Moch consider them due to contractions of the uterine muscle, and do not think that they have in any instance been brought on by a passage of

the solution into the tubes or peritoneal cavity, since the amount used is too small, and no pressure is employed. Although this method of treatment is employed, they state, almost daily in Delbet's clinic, no case of cervical atresia or other serious consequence has been observed, and in 3 cases pregnancy has occurred following cessation of treatment. As a rule, three or four, or even more injections are necessary, though in some instances one suffices. Enough time is allowed to elapse between treatments to permit the slough which forms to be discharged, this usually requiring about six or seven days.

OPHTHALMOLOGY

UNDER THE CHARGE OF

EDWARD JACKSON, A.M., M.D.,

DENVER, COLORADO,

AND

T. B. SCHNEIDEMAN, A.M., M.D.,

PHILADELPHIA.

Keratitis Punctata Subepithelialis.—GRADLE (*Arch. of Ophthal.*, xl, No. 5, 534) describes under the above term a form of keratitis of unknown etiology which occurs in females usually past the age of thirty. This keratitis occurs in the form of isolated grayish infiltrated-looking areas, lying under Bowman's membrane, with an intact superficial epithelium and characterized by subjective injection and photophobia. It occurs at varying intervals in either eye and is self-limited. It does not seem to be markedly affected by any known form of treatment.

Pathology of Superficial Punctate Keratitis.—From a study of this condition, VERHOEFF (*Arch. of Ophthal.*, xl, No. 5, 486) comes to the following conclusions: Superficial punctate keratitis (Fuchs) is a form of neuropathic keratitis. The corneal lesions in this condition consist of slowly formed necrotic leukocytic infiltrates, seated beneath Bowman's membrane, and are due to the action of pyogenic diffusible toxic substances arising at nerve terminals. Clinical evidence indicates that the causal nerve lesion is in the ciliary ganglion, and that it is probably due to the elective action of a systemic toxin on certain of the ganglion cells therein. In this affection there sometimes occurs well-marked focal proliferation of the iris bloodvessels. This observation confirms the view that vascular nevi are neuropathic in origin, and suggests that certain angiomas arising later in life may have a similar origin. Disciform keratitis (Fuchs) is essentially of the same nature as superficial punctate keratitis, and is likewise neuropathic in origin. Traumatic relapsing keratitis is due to a state of irritability in the peripheral ganglion cells of the corneal nerves, resulting from intense stimulation of the nerve terminals.

Treatment of the Early Stages of Senile Cataract.—Henry Smith, I.M.S. (*Arch. of Ophthal.*, July, 1912, p. 323) has obtained marked improvement in the vision in 8 cases of incipient senile cataract by subconjunctival injection of cyanide of mercury (20 minims of 1 in 4000). He considers that where vision has been reduced by half or less for distance, the case is amenable to treatment. If reduced over a half, there is little hope of improvement. The most promising cases are those in which distant vision has been reduced by about 30 per cent. or under. The pain induced by subconjunctival injection of mercury under cocaine is very severe for three or four hours. To control which the patient should be put lightly under chloroform and given at least one-third grain of morphine hypodermically. The eye looks exceedingly ugly for several days, though he has never seen any evil results. The improvement was first noticed on the third or fourth day and continued steadily for several months.

Sclerectomy with Iridectomy in Chronic Glaucoma: Lagrange Operation.—Gruening (*Amer. Oph. Soc. reported in the Amer. Jour. of Ophthal.*, July, 1912, p. 208) has performed this operation 21 times on patients, aged from twenty-three to eighty-two years, with intraocular tension varying from 35 to 55 mm. mercury. The tension was permanently reduced in all with decided improvement of vision in the majority. General anesthesia was required in most of the cases. When properly performed with a well applied conjunctival flap, the wound closes in a short time, the anterior chamber is restored, and the intraocular tension more permanently reduced than after a simple iridectomy.

The Size of the Blind Spot and its Distance from the Point of Fixation in Emmetropia.—Van Der Hoeve (*Arch. Ophthal.*, July, 1912, p. 350), from the investigation of 100 practically normal eyes, found the centre of the blind spot in the horizontal direction to be situated 15° 33′ 47″ from the point of fixation; in the vertical direction, 1° 40′ 41″ below. The horizontal diameter measures 5° 42′ 55″; the vertical diameter, 7° 26′; and that it is surrounded by a zone relatively blind for white, $\frac{1}{8}$° to $\frac{1}{4}$°, and a zone relatively blind for colors $\frac{1}{8}$° to $\frac{3}{4}$°. If these figures are computed according to Landolt, the horizontal distance from the middle point of the fovea is 4 + mm.; vertical distance, 0.44+ mm.; disk diameter, 1.6125 mm.; disk height, 2.025 mm. The horizontal diameter of the papilla, 1.6125 mm. corresponds closely with a number of anatomical measurements. From these observations he believes that a horizontal diameter of the blind spot of 7° is too large, and one over 6° is suspicious and requires further investigation.

Failure in Strabismus Operations.—Bielschowsky (*Arch. Ophthal.*, March, 1912, p. 134) makes a study of those exceptional causes of failure in the operative treatment of strabismus which occasionally occur. He urgently warns against precipitate operations; repeated examinations are requisite to determine possible deviations from the typical such as the dissociated character of the anomaly, the inconstancy of the angle, and its dependence upon physical and psychic conditions. As there are generally no subjective symptoms in ordinary

typical strabismus, search should be made for a neurosis when subject symptoms are present. The smaller the degree of strabismus and the more prominent the intensity of the subjective complaints, the greater conservatism should be exercised in regard to operation. If operation is insisted upon, the patient should be informed of the uncertainty of the result and of the possibility of the appearance and continuance of diplopia after operation. Finally, in spite of all precautions and care, there will be occasional unavoidable failures; the number will become smaller in proportion as the manifold factors in the etiology of strabismus, which form the basis for rational therapy, become more exactly defined.

Dust-like Opacities in the Vitreous.—STRAUB, before the Ophthalmological Society of the United Kingdom (*Amer. Jour. Ophthal.*, February, 1912, p. 54) argued that inflammation of the vitreous body, for which he proposed the name "hyalitis," should be recognized as an independent affection. He injected into the vitreous body of the rabbit some pathogenic microbes. These microbes grew there and there only and attracted to the vitreous body serum and leukocytes, both of which latter were derived from the vessels of the ciliary body, but this did not constitute cyclitis. When pathogenic microbes were injected into the ciliary body itself, a real cyclitis, quite different from the hyalitis which occurred in the first experiment, was produced. As the two forms can be distinguished in the laboratory, the same distinction should also be made clinically. But this has not yet been done. The text-books state that the ciliary body pours out its exudate into the vitreous, but this is a mistake, as leukocytes do not allow themselves to be poured out. Metchnikoff has said that leukocytes only went where they were attracted by chemotactic bodies. When there were microbes in the vitreous those substances went toward the vitreous body; when microbes were in the ciliary body the leukocytes went to the ciliary body. He also felt sure that the vitreous body obtained no leukocytes from the cornea; in inflammation of the vitreous body the leukocytes come from the vitreous body.

PATHOLOGY AND BACTERIOLOGY

UNDER THE CHARGE OF

JOHN McCRAE, M.D., M.R.C.P.,

LECTURER ON PATHOLOGY AND CLINICAL MEDICINE, MC GILL UNIVERSITY, MONTREAL; SOME TIME PROFESSOR OF PATHOLOGY IN THE UNIVERSITY OF VERMONT, BURLINGTON, VERMONT; SENIOR ASSISTANT PHYSICIAN, ROYAL VICTORIA HOSPITAL, MONTREAL.

Immunity Transmission from Mother to Offspring.—It has been well established that passive transmission of antibodies from mother to offspring occurs, and to determine if this happens chiefly by way of the placenta or through the milk. L. W. FAMULENER (*Jour. of Infect. Diseases*, 1912, vol. x., No. 3) has undertaken some careful

experimentation, making use of hemolysins. It has been determined with all but certainty that hemolysins could be transmitted through the placenta to the fetus, but, on the other hand, many fetuses from abortions failed to show such hemolysins. From Famulener's work, as well as that of others, it appears that goats, highly immunized against sheep erythrocytes at a late period of gestation, transmit the specific antibodies to the suckling, and this not so much by the placenta as by the colostrum, much less so by the milk. Especially when immunization has been done during the period of gestation is the colostrum powerful in this regard, even more so than the blood serum. If the mother were immunized after the birth of the young, the sucklings failed to gain any demonstrable immuniity. Even though the colostrum be rich, the milk may not be so, and often the hemolytic antibodies disappear rapidly from the latter. It must be stated, also, that a very high degree of immunity is necessary in the parent animal before appreciable amounts of antibodies are excreted by way of the milk.

A Suggested Explanation of the Apical Lesion in Tuberculosis.—As a result of their work upon the relation of animal fat to tubercle bacillus fat, WM. CHARLES WHITE and A. MARION GAMMON (*Jour. of Med. Research*, June, 1912, vol. xxvi, No. 2) bring forward a reasonable suggestion of the frequency with which pulmonary tuberculosis attacks the apices of the lungs. By adding to culture media of various kinds fats sufficiently fluid to mix, it was found that the growth of the bacilli was greatly enhanced, even to hundreds of times as abundant a growth as that upon the simple media. Still more striking was the effect if the fat were acted upon by liver extract, so that split products of the fats were obtained. Leather had shown that the fats stored in the tissues in general are mobilized in the liver, and there prepared for use by other organs of the body. The liver-altered fat is poured into the inferior vena cava and thence into the pulmonary system. In the pulmonary artery, just before the division into the right and left branches, a great bag of blood is formed, "the blood in this portion must move with comparative slowness," and the light fatty compounds have a chance to rise in this blood, and at the highest point of this stream the vessel arises which supplies the apex of each upper lobe; so that the fat laden blood of the apex of the lung, with its qualities as a culture mediun thus increased, tend to the greater liability of the apex to become the seat of infection.

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All communications should be addressed to—

DR. GEORGE MORRIS PIERSOL, 1927 Chestnut St., Phila., Pa., U. S. A.